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Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **774**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **775**

89 ASTRONOMY **782**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **784**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **785**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **786**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **786**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **787**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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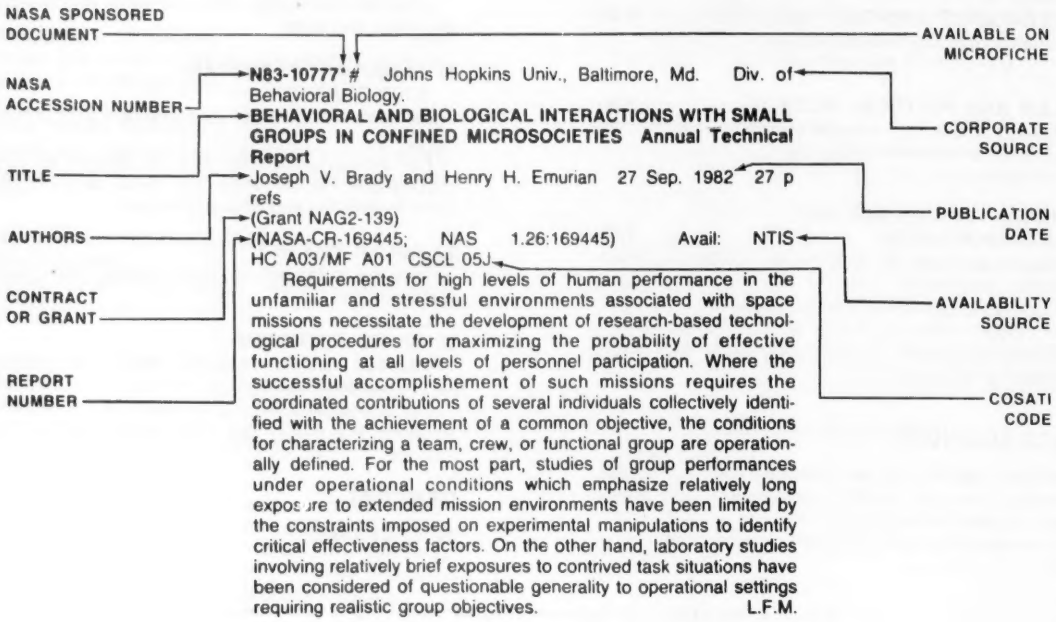
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N83-10777* # Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
CORPORATE SOURCE
TITLE
BEHAVIORAL AND BIOLOGICAL INTERACTIONS WITH SMALL GROUPS IN CONFINED MICROSOCIETIES Annual Technical Report
AUTHORS
Joseph V. Brady and Henry H. Emurian 27 Sep. 1982 27 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Grant NAG2-139)
REPORT NUMBER
(NASA-CR-169445; NAS 1.26:169445) Avail: NTIS HC A03/MF A01 CSCL 05J
AVAILABILITY SOURCE
COSATI CODE
Requirements for high levels of human performance in the unfamiliar and stressful environments associated with space missions necessitate the development of research-based technological procedures for maximizing the probability of effective functioning at all levels of personnel participation. Where the successful accomplishement of such missions requires the coordinated contributions of several individuals collectively identified with the achievement of a common objective, the conditions for characterizing a team, crew, or functional group are operationally defined. For the most part, studies of group performances under operational conditions which emphasize relatively long exposure to extended mission environments have been limited by the constraints imposed on experimental manipulations to identify critical effectiveness factors. On the other hand, laboratory studies involving relatively brief exposures to contrived task situations have been considered of questionable generality to operational settings requiring realistic group objectives. L.F.M.

VOLUME 21 NUMBER 5/MARCH 8, 1983

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N83-14061*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN ANALYTICAL AND EXPERIMENTAL COMPARISON OF THE FLOW FIELD OF AN ADVANCED SWEPT TURBOPROP
Harvey E. Neumann, Lawrence J. Bober, John S. Serafini, and Li-Ko Chang (Purdue Univ., Lafayette, Ind.) 1983 16 p refs Presented at the 21st Aerospace Sci. Conf., Reno, Nev., 10-13 Jan. 1983; sponsored by AIAA Original contains color illustrations
(NASA-TM-83037; E-1481; NAS 1.15:83037; AIAA-83-0189) Avail: NTIS HC A02/MF A01 CSCL 01B

An argon ion laser velocimeter with four beams was used to measure the detailed flow-field of an advanced eight blade propeller with 45% of tip sweep in an 8x6 foot supersonic wind tunnel. Data were obtained at a free stream Mach number of 0.8, the design advance ratio of 3.06 and a power coefficient of 1.8. Data are presented for inlet flow, exit flow, flow within the blades and flow slightly outside the blade tips. The data are compared to a lifting line theory. In general, the results of the comparison are considered favorable. R.J.F.

N83-14062# Clemson Univ., S.C. Dept. of Industrial Management.
COST FUNCTIONS FOR AIRFRAME PRODUCTION PROGRAMS Final Report
N. Keith Womer and Thomas R. Gulledge Jul. 1982 201 p refs (Contracts F33615-81-K-5116; N00014-75-C-0451)
(AD-A119788) Avail: NTIS HC A10/MF A01 CSCL 14/1

The research objectives were: (a) develop, test, and illustrate the use of a significant new approach to estimating the cost of an airframe production program using already collected data on Air Force airframes; and (b) provide the Air Force with a calibrated tool capable of providing timely answers to significant problems of program management. The researcher developed a model based on the four production cost drivers of learning by doing, learning over time, the speed of the production line, and production line length. It focuses on the production of an individual airframe as a function of its start date and its planned delivery date, and includes technical features of both the airframe production program and the contractor's behavior. The model is estimated from data on the C-141 program, and is used to evaluate the effect of several small changes to the delivery schedule for the C-141. This analysis shows the sensitivity of the model to delivery schedule changes. It also illustrates one of the important ways that the model may be used in program management. A detailed investigation of estimating the model on data from other programs revealed that its parameters are very stable from one program to another, and the parameters can be estimated from early actual data on a new program. Ways to combine the model with a cost estimating relation (CER) and update these estimates with early actual data are discussed in this report. These techniques are applied to data from the F-102 program and the F-5/T-38 program. GRA

N83-14063# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CHINESE AVIATION IN THE EYES OF AMERICAN EXPERTS
Charlie Garroy 29 Jul. 1982 11 p Transl. into ENGLISH from Hangkong Zhishi (China), no. 10, 1981 p 18-19
(AD-A118961; FTD-ID(RS)T-0607-82) Avail: NTIS HC A02/MF A01 CSCL 01/2

The history of aeronautics and aerospace industry in the peoples republic of China was surveyed. Topics discussed are: production of airplanes, production of aircraft engines; research and development, and testing of aircraft engines. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N83-14064# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
APPLIED COMPUTATIONAL TRANSONIC AERODYNAMICS
Aug. 1982 108 p refs
(AGARD-AG-266; ISBN-92-835-1431-9) Avail: NTIS HC A06/MF A01

A review of state of the art computational fluid dynamics as applied to the transonic computational design of combat and airlift aircraft is given. The theoretical fluid dynamics bases on which computer programs are based are discussed. Viscous interactions, computational procedures used in aerodynamic design, and advanced concepts are discussed. R.J.F.

N83-14065# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
COMPENDIUM OF UNSTEADY AERODYNAMIC MEASUREMENTS
Aug. 1982 192 p refs
(AGARD-R-702; ISBN-92-835-1430-0) Avail: NTIS HC A09/MF A01

A compendium intended to assist the development of improved methods of predicting transonic unsteady aerodynamics and aeroelastic response by collecting the known unsteady aerodynamic experimental data for two dimensional and three dimensional aeroelastic configurations is given. R.J.F.

N83-14066*# Neilsen Engineering and Research Co., Palo Alto, Calif.
MEAN-FLOW MEASUREMENTS OF THE FLOW FIELD DIFFUSING BEND Final Report
O. J. McMillan Washington NASA Nov. 1982 166 p refs (Contract NAS3-22113)
(NASA-CR-3634; NAS 1.26:3624; NEAR-TR-271) Avail: NTIS HC A08/MF A01 CSCL 01A

Time-average measurements of the low-speed turbulent flow in a diffusing bend are presented. The experimental geometry consists of parallel top and bottom walls and curved diverging side walls. The turning of the center line of this channel is 40 deg, the area ratio is 1.5 and the ratios of height and center-line length to throat width are 1.5 and 3, respectively. The diffusing bend is preceded and followed by straight constant area sections. The inlet boundary layers on the parallel walls are artificially thickened and occupy about 30% of the channel height; those on the side walls develop naturally and are about half as thick. The free-stream speed at the inlet was approximately 30 m/sec for all the measurements. Inlet boundary layer mean velocity and turbulence intensity profiles are presented, as are data for wall static pressures, and at six cross sections, surveys of the velocity-vector and static-pressure fields. The dominant feature of the flow field is a pair of counter-rotating streamwise vortices formed by the cross-stream pressure gradient in the bend on which an overall deceleration is superimposed. A.R.H.

N83-14067*# Florida Univ., Gainesville. Dept. of Engineering Sciences.
THE INVESTIGATION OF THE FLOW ABOUT GENERAL FUSELAGE SHAPES AT HIGH ANGLES OF ATTACK Final Report, 1 Nov. 1979 - 31 Oct. 1982
Mark H. Clarkson 14 Dec. 1982 8 p refs
(Contract NCC2-23)
(NASA-CR-169611; NAS 1.26:169611) Avail: NTIS HC A02/MF A01 CSCL 01A

Water tunnel visualization of the flow about bodies at high angles of attack was done. Wind tunnel tests on a series of models with non-circular cross sections are reported. N.W.

N83-14068*# San Jose State Univ., Calif. Dept. of Mechanical Engineering.
AN EXPERIMENTAL INVESTIGATION OF INTERNAL AREA RULING FOR TRANSONIC AND SUPERSONIC CHANNEL FLOW Final Scientific Report, 25 Sep. 1981 - 24 Sep. 1982
William B. Roberts, Harry L. vanRintel, and Ghaus Rizvi 24 Aug. 1982 99 p refs
(Grant NAG3-196)
(NASA-CR-169638; NAS 1.26:169638) Avail: NTIS HC A05/MF A01 CSCL 01A

A simulated transonic rotor channel model was examined experimentally to verify the flow physics of internal area ruling. Pressure measurements were performed in the high speed wind tunnel at transonic speeds with Mach 1.5 and Mach 2 nozzle blocks to get an indication of the approximate shock losses. The results showed a reduction in losses due to internal area ruling with the Mach 1.5 nozzle blocks. The reduction in total loss coefficient was of the order of 17 percent for a high blockage model and 7 percent for a cut-down model. Author

N83-14069*# Wisconsin Univ., Milwaukee. Dept. of Mechanical Engineering.
TURBULENT TRANSPORT MODELING OF SHEAR FLOWS AROUND AN AERODYNAMIC WING. DEVELOPMENT OF TURBULENT NEAR-WALL MODEL AND ITS APPLICATION TO RECIRCULATING FLOWS Semiannual Progress Report, 1 Jun. - 1 Dec. 1982
Ryoichi S. Amano 27 Dec. 1982 62 p refs
(Grant NAG2-160)
(NASA-CR-169665; NAS 1.26:169665; SAPR-1) Avail: NTIS HC A04/MF A01 CSCL 01A

Progress in implementing and refining two near-wall turbulence models in which the near-wall region is divided into either two or three zones is outlined. These models were successfully applied to the computation of recirculating flows. The research was further extended to obtaining experimental results of two different recirculating flow conditions in order to check the validity of the present models. Two different experimental apparatuses were set up: axisymmetric turbulent impinging jets on a flat plate, and turbulent flows in a circular pipe with a abrupt pipe expansion. It is shown that generally better results are obtained by using the present near-wall models, and among the models the three-zone model is superior to the two-zone model. Author

N83-14070*# Southampton Univ. (England).
AERODYNAMIC DATA FROM A TWO-DIMENSIONAL CAMBERED AIRFOIL SECTION IN A SHALLOW TRANSONIC FLEXIBLE WALLED TEST SECTION Progress Report
S. W. D. Wolf Oct. 1982 146 p refs
(Grant NsG-7172)
(NASA-CR-166005; NAS 1.26:166005; AASU-Memo-82/7) Avail: NTIS HC A07/MF A01 CSCL 01A

Further flexible wall technique validation in two dimensional testing was carried out with the transonic self streamlining wind tunnel (TSWT) using a cambered NPL 9510 section. Author

N83-14071*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TABULATIONS OF STATIC PRESSURE COEFFICIENTS ON THE SURFACES OF 3 PYLON-MOUNTED AXISYMMETRIC FLOW-THROUGH NACELLES AT MACH NUMBERS FROM 0.40 TO 0.98
Richard J. Re and Kathryn H. Peddrew Sep. 1982 122 p
(NASA-TM-84540; NAS 1.15:84540) Avail: NTIS HC A06/MF A01 CSCL 01A

Three flow through nacelles mounted on an 82 deg swept pylon (10 percent thickness-to-chord ratio) were tested in the Langley 16 foot Transonic Tunnel. The long uncambered pylon was supported from a small body of revolution so that pressure measurements on the nacelle and pylon represent a pylon nacelle flow field without a wing present. Two nacelles had NACA 1-85-100 inlets and different circular arc afterbodies. The third nacelle had an NACA 1-70-100 inlet with a circular arc afterbody having the same external shape as one of the other nacelles. Nacelle length to maximum diameter ratio was 3.5. Data were obtained at angles of attack from 2 deg to 8 deg at selected Mach numbers. Author

N83-14072# Sandia Labs., Albuquerque, N. Mex.
WIND RIPPLE IN VERTICAL-AXIS WIND TURBINES
R. E. Akins 1981 12 p refs Presented at 5th Biennial Wind Energy Conf. and Workshop, Washington, D.C., 5 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003496; SAND-81-2120C; CONF-811043-8) Avail: NTIS HC A02/MF A01

The aerodynamically induced fluctuations in the output of a VAWT have often been considered a disadvantage of such systems. The fluctuations observed in the output of a VAWT are composed of contributions due to aerodynamic effects, incident turbulence, and in some cases, mechanical resonances. In order to quantitatively assess these effects, experimental techniques have been developed which allow analysis of full scale performance of wind turbines with particular emphasis on the effects caused by turbulence in the incident wind. These methods have been used to monitor the performance of the DOE/Sandia 17 m VAWT. Results are presented which provide an indication of the effects of incident turbulence intensity on the fluctuations in output of the turbine. Trends which relate the fluctuations in output to the fluctuations in incident wind are identified and discussed. DOE

N83-14073# Florence Univ. (Italy). Sezione Macchine.
ONE-DIMENSIONAL FLOW ANALYSIS BY TIME DEPENDENT METHODS [ANALISI DEL FLUSSO MONODIMENSIONALE CON METODI TIME DEPENDENT]
F. Martelli and G. Bidini 1981 29 p refs In ITALIAN
Avail: NTIS HC A03/MF A01

One dimensional, nonviscous, transonic flow in convergent-divergent nozzles is studied by time dependent methods. With these methods the partial differential equations are hyperbolic either for subsonic or supersonic flows, allowing the use of the same calculation procedure in both cases. Several stability criteria are reviewed, including Courant, Friedrichs, Lewy and Von Neuman criteria. Numerical finite differences procedures are studied and for each case the stability and convergence are analyzed. These

approachs include Euler, Lax, dumping surface, leapfrog, Lax-Wendroff and MacCormack schemas. Author (ESA)

N83-14933# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Launch and Flight Div.
GRID GENERATION TECHNIQUES FOR PROJECTILE CONFIGURATIONS
Charles J. Nietubicz, Karen R. Heavey, and Joseph L. Steger (Stanford Univ., Palo Alto, Calif.) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 99-122 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 01/2

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N83-14074# Comptroller General of the United States, Washington, D.C.
AIRCRAFT THRUST/POWER MANAGEMENT CAN SAVE DEFENSE FUEL, REDUCE ENGINE MAINTENANCE COSTS, AND IMPROVE READINESS
29 Jul. 1982 51 p refs
(GAO/PLRD-82-74) Avail: NTIS HC A04/MF A01

It was found that the Department of Defense could achieve additional savings in aircraft fuel and reduce engine maintenance costs by making greater use of reduced power takeoffs and climbs by fighter aircraft. It is recommended that effective local initiatives be better identified, reviewed, and implemented whenever possible. R.J.F.

N83-14075# General Accounting Office, Washington, D. C. Community and Economic Development Div.
THE CHANGING AIRLINE INDUSTRY: A REPORT, 1981 Status Report
24 Jun. 1982 34 p refs Supersedes CED-81-103
(GAO/CED-82-94; B-197119; CED-81-103) Avail: NTIS HC A03/MF A01, SOD HC $3.25

Changes in the airline industry since passage of the Airline Deregulation Act of 1978 are discussed. Airline traffic; fares; profits; productivity; air service patterns, including service to small communities; and the safety records of domestic passenger airlines before and after the start of deregulation are considered. S.L.

N83-14076*# Spectrum Technology, Inc., Virginia Beach, Va.
SINGLE PILOT IFR ACCIDENT DATA ANALYSIS Final Report
D. F. Harris and J. A. Morrisete Washington NASA Nov. 1982 102 p refs
(Contract NAS1-16920)
(NASA-CR-3650; NAS 1.26:3650) Avail: NTIS HC A06/MF A01 CSCL 01C

The aircraft accident data recorded and maintained by the National Transportation Safety Board for 1964 to 1979 were analyzed to determine what problems exist in the general aviation single pilot instrument flight rules environment. A previous study conducted in 1978 for the years 1964 to 1975 provided a basis for comparison. The purpose was to determine what changes, if any, have occurred in trends and cause-effect relationships reported in the earlier study. The increasing numbers have been tied to measures of activity to produce accident rates which in turn were analyzed in terms of change. Where anomalies or unusually high accident rates were encountered, further analysis was conducted to isolate pertinent patterns of cause factors and/or experience levels of involved pilots. The bulk of the effort addresses accidents in the landing phase of operations. A detailed analysis was performed on controlled/uncontrolled collisions and their unique attributes delineated. Estimates of day vs. night general aviation activity and accident rates were obtained. M.G.

N83-14077*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIGHTNING ATTACHMENT PATTERNS AND FLIGHT CONDITIONS FOR STORM HAZARDS, 1980
Bruce D. Fisher, Gerald L. Keyser, Jr. (Air Force Systems Liaison Office, Langley, Va.), and Perry L. Deal Dec. 1982 71 p refs Prepared in cooperation with Lightning Technologies, Inc.
(Contract NAS1-15884)
(NASA-TP-2087; L-15438; NAS 1.60:2087) Avail: NTIS HC A04/MF A01 CSCL 01C

As part of the NASA Langley Research Center Storm Hazards Program, 69 thunderstorm pentrations were made in 1980 with an F-106B airplane in order to record direct strike lightning data and the associated flight conditions. Ground based weather radar measurements in conjunction with these penetrations were made by NOAA National Severe Storms Laboratory in Oklahoma and by NASA Wallops Flight Center in Virginia. In 1980, the airplane received 10 direct lightning strikes; in addition, lightning transient data were recorded from 6 nearby flashes. Following each flight, the airplane was thoroughly inspected for evidence of lightning attachment, and the individual lightning attachment points were plotted on isometric projections of the airplane to identify swept flash patterns. This report presents pilot descriptions of the direct strikes to the airplane, shows the strike attachment patterns that were found, and discusses the implications of the patterns with respect to aircraft protection design. The flight conditions are also included. Finally, the lightning strike scenarios for three U.S. Air Force F-106A airplanes which were struck during routine operations are given in the appendix to this paper. Author

N83-14078*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA LEWIS RESEARCH CENTER'S PROGRAM ON ICING RESEARCH
J. J. Reinmann, R. J. Shaw, and W. A. Olsen, Jr. 1982 17 p refs Proposed for presentation at the 21st Aerospace Sci. Conf., Reno, Nev., 10-13 Jan. 1983; sponsored by AIAA and presented at the 1st Intern. Workshop on Atmospheric Icing of Struct., Hanover, N.H., 1-3 Jun. 1982; sponsored by EPRI and the Army Cold Regions Research and Engineering Lab.
(NASA-TM-83031; E-1469; NAS 1.15:83031; AIAA-83-0204) Avail: NTIS HC A02/MF A01 CSCL 01C

The helicopter and general aviation, light transport, and commercial transport aircraft share common icing requirements: highly effective, lightweight, low power consuming deicing systems, and detailed knowledge of the aeropenalties due to ice on aircraft surfaces. To meet current and future needs, NASA has a broadbased icing research program which covers both research and engineering applications, and is well coordinated with the FAA, DOD, universities, industry, and some foreign governments. Research activity in ice protection systems, icing instrumentation, experimental methods, analytical modeling, and in-flight research are described. A.R.H.

N83-14079# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
PRELIMINARY DEVELOPMENT OF THE XV (EX-VEE) AIRCREW RESTRAINT
Dan Lorch 11 May 1982 33 p refs
(WO584001)
(AD-A118991; NADC-82106-60) Avail: NTIS HC A03/MF A01 CSCL 01/3

High-performance aircraft undergoing air combat maneuvers often subject air crewman to acceleration loads which displace them so far out of position that they can no longer control their aircraft. The XV restraint harnesss is being designed to reduce vertical (Z) displacement of aircrewmen in ejection seat equipped aircraft; it is also a parachute harness. Initial testing indicates that the XV restraint harness provides improvement over the MA-2 torso harness for inflight acceleration loads. In addition, it is adjustable for all size crewmen, is seat mounted, and provides either manual or automatic release of the parachute, survival kit, and harness upon water immersion. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N83-14080# Federal Aviation Administration, Washington, D.C. Program Engineering and Maintenance Service.
THIRD SYMPOSIUM ON TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEMS (TCAS)
1982 271 p Symp. held at Washington, D.C., 12-13 Oct. 1982 (FAA-RD-82-75) Avail: NTIS HC A12/MF A01

The Federal Aviation Administration held its third symposium on Traffic Alert and Collision Avoidance System (TCAS) in Washington, D.C., October 12-13, 1982, which was attended by representatives of organizations and airlines. This report contains twelve technical presentations describing the progress of the TCAS program. The TCAS will provide a range of capabilities and costs which will meet the requirements of all airspace users. The least complex part of the system is designed for private pilots and would cost about $2,500. The fully capable, or airline, version would cost between $45,000 and $50,000. For individual titles, see N83-14081 through N83-14096.

N83-14081# Federal Aviation Administration, Washington, D.C. Program Engineering and Maintenance Service.
TCAS PROGRAM
Clyde A. Miller *In its* 3rd Symp. on Traffic Alert and Collision Systems (TCAS) 1982 p 1-4 (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

The Traffic Alert and Collision Avoidance System program activities are described. The essence of the TCAS concept is the provision of a separation assurance capability that is able to operate throughout the airspace without reliance on ground equipments. TCAS, like it's predecessor BCAS (Beacon Collision Avoidance System), is based on the interchange of beacon, or secondary surveillance radar, signals among aircraft. The TCAS concept envisions a range of capabilities to include TCAS I, a low cost alternative, and TCAS II which is intended to provide a comprehensive level of separation assurance in all airspace. L.F.M.

N83-14082# Federal Aviation Administration, Washington, D.C. Program Engineering and Maintenance Service.
STATUS OF MODE S IMPLEMENTATION
Douglas Hodgkins *In its* 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 12 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

Mode S is an evolutionary upgrading of our present Air Traffic Control (ATC) Radar Beacon System. It will provide improved aircraft position and interference free identification and altitude data, and a new capability to communicate digitally with the aircraft via a data link. The data link is both ground-to-air and air-to-ground and is an integral part of the surveillance function. Many ATC automation enhancements are possible with the data link capability as well as other services. L.F.M.

N83-14083# Federal Aviation Administration, Washington, D.C. Program Engineering and Maintenance Service.
TCAS 2 OPERATIONAL DOCTRINE
Clyde A. Miller *In its* 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 20 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

As a result of FAA testing of the Traffic Alert and Collision Avoidance System II, conclusions are reached. These conclusions presented here are with respect to the role of traffic advisories in airborne collision avoidance systems and to flight crew response to resolution advisories. L.F.M.

N83-14084# Lincoln Lab., Mass. Inst. of Tech., Lexington.
COMPARISON OF TCAS 1 PASSIVE AND ACTIVE TRANSPONDER DETECTORS
Vincent A. Orlando *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 18 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

Active and Passive Transponder Detector systems are compared. Measurements indicate that a low power Traffic Alert and Collision Avoidance System I will provide better performance than the simple passive techniques evaluated. Time sharing transponder transmitter and receiver elements make the cost of the active approach equivalent to the passive approach. L.F.M.

N83-14085# Mitre Corp., Bedford, Mass.
AIRCRAFT TRAFFIC IN THE LOS ANGELES BASIN AS RELATED TO TCAS REQUIREMENTS
Ned A. Spencer and Bela P. Collins *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 11 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

Four different flights were conducted in the Los Angeles area to collect airborne data. The instantaneous airborne count (IAC) as measured by the flight data is compared with the total daily operations of the 17 towers in the Los Angeles basin. A remarkably consistent relation was observed. Accounting for the fraction of non-transponder aircraft, it is seen that an IAC of approximately 212 aircraft corresponds with 10,000 tower operations, and the relation is linear. This together with the relation between IAC and density already established provide the rules needed to project future environments. L.F.M.

N83-14086# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SURVEILLANCE TECHNIQUES FOR MINIMUM TCAS 2
Jerry D. Welch *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 11 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

Techniques to achieve air-to-air surveillance in high density airspace are discussed. A review of the Traffic Alert and Collision Avoidance II; (TCAS II) surveillance requirements is given and then attention is placed on Mode S and ATCRBS surveillance. Discussions of interference limiting and a summary of the TCAS II design as now envisioned follows. L.F.M.

N83-14087# Lincoln Lab., Mass. Inst. of Tech., Lexington.
VALIDATION OF MINIMUM TCAS 2 SURVEILLANCE PERFORMANCE
William H. Harman *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems 1982 16 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

The activities being used to validate the Traffic Alert and Collision Avoidance System II techniques are described. The most prominent new issues are Mode C directional interrogation and whisper-shout, which are the main techniques for avoiding synchronous garble in high density airspace. L.F.M.

N83-14088# Bendix Corp., Baltimore, Md. Communications Div.
ENHANCED TCAS 2
J. Emory Reed *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems 1982 17 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

The essence of the Enhanced Traffic Alert and Collision Avoidance II system is characterized by accurate bearing, narrow sectorized interrogation control, and tailored system parameters. The Bendix approach was to apply advanced technology in three main areas: optimized system design, antenna technology, and adaptive control. L.F.M.

N83-14089# Mitre Corp., Bedford, Mass.
MINIMUM TCAS 2 THREAT DETECTION AND RESOLUTION LOGIC STATUS
Andrew Zeitlin *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems 1982 20 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

A status update on the Collision Avoidance Logic for Minimum TCAS II is given. The process of refinement continued, using data from flight tests and simulation. All problems that were observed were solved. Improved features were added. New developments and features in the logic are covered. Validation activities are also briefly described. Author

N83-14090# Federal Aviation Administration, Atlantic City, N.J.
TCAS 2 THREAT DETECTION AND RESOLUTION LOGIC TESTING
Barry R. Billmann *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 19 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

Horizontal and vertical track crossing and maneuvering are illustrated. Preprocessor incremental scenario modification is diagrammed. Level flight scenario results are provided. The impact of equal treatment for TCAS intruders, the impact on jumps in Mode C surveillance data, and closed loop pilot feedback were studied. N.W.

N83-14091# Dalmo Victor Co., Belmont, Calif.
TCAS 2
In FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 37 p (For primary document see N83-14080 05-04) (DV-10496) Avail: NTIS HC A12/MF A01

Three prototype systems of the omnidirectional TCAS system which were successfully flight tested on FM Piedmont aircraft were delivered to the FAA. Author

N83-14092# Federal Aviation Administration, Washington, D.C. Program Engineering and Maintenance Service.
EVALUATION OF TCAS 2 IN AN AIR CARRIER ENVIRONMENT
W. L. Hyland *In its* 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 16 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

The first part of a two part cockpit simulation with the Boeing Aircraft Company to evaluate the display media and use of the TCAS information under workload, principally in IMC conditions was completed. An initial effort with Piedmont Airlines, intended to build a large data base with TCAS II in actual line operations, was completed. Author

N83-14093# Lincoln Lab., Mass. Inst. of Tech., Lexington.
UTILITY OF TRAFFIC ADVISORY INFORMATION
John W. Andrews *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 15 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

The findings of FAA sponsored evaluations of the operational utility of TCAS II traffic advisories are summarized. The history of previous test programs involving subject pilots and automated traffic advisories is traced. The operational context of the TCAS II automated traffic advisory is explained. Results of the testing done to date are presented. Some areas in which further testing and development will be undertaken are outlined. Author

N83-14094# Federal Aviation Administration, Washington, D.C. Program Engineering and Maintenance Service.
TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM
In its 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 6 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

An aircraft separation assurance concept called the Traffic Alert and Collision Avoidance System (TCAS) is reviewed. The concept is based on efforts in the areas of beacon based collision avoidance systems and air-to-air/air-to-ground discrete address communications techniques utilizing Mode S message formats. The objective of the TCAS approach is to provide a range of separation assurance equipment alternatives that can provide collision protection for the full spectrum of airspace users ranging from small general aviation aircraft to large transport aircraft. Author

N83-14095# Aries Corp., McLean, Va.
PRELIMINARY SUMMARY OF PHASE 1 PIEDMONT IN-SERVICE EVALUATION OF TCAS 2
Tom Berry and Tom Williamson (FAA) *In* FAA 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 11 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

Data was collected on the operational performance of the TCAS during 928 hours of flight time. This data was generated from two sources: (1) a data recording system aboard the Boeing 727 test aircraft that recorded quantitative data generated by the TCAS each time the system detected a potential conflict and activated the system displays, and (2) qualitative comments on the system performance and utility of TCAS, prepared by cockpit observers who were skilled in jet transport operations. Author

N83-14096# Federal Aviation Administration, Washington, D.C.
SUMMARY OF DALMO VICTOR AND LINCOLN LABORATORY PWI BEARING PERFORMANCE
In its 3rd Symp. on Traffic Alert and Collision Avoidance Systems (TCAS) 1982 13 p (For primary document see N83-14080 05-04)
Avail: NTIS HC A12/MF A01

The results of bearing accuracy and tracking tests performed using the Lincoln Laboratory TCAS Experimental Unit (TEU) and the Dalmo Victor omnidirectional TCAS are summarized. The TEU data which is presented was obtained from Lincoln Laboratory flight tests in the Boston area. The TEU bearing tests were also conducted at the FAA Technical Center. Dalmo Victor omnidirectional TCAS bearing data was obtained from anechoic chamber tests at Dalmo Victor; static tests at FAA Technical Center, and flight tests at the FAA Technical Center. A bearing track from a Piedmont flight during which a resolution advisory occurred is also shown. Author

N83-14097# Electromagnetic Compatibility Analysis Center, Annapolis, Md.
MICROWAVE LANDING SYSTEM (MLS) CHANNEL PLANS AND TRAFFIC LOADING Final Report
A. Koshar (IIT Res. Inst., Annapolis, Md.) and J. Smithmyer (IIT Res. Inst., Annapolis, Md.) May 1982 16 p
(DOT/FAA-RD-81-113) Avail: NTIS HC A02/MF A01

The magnitude of the maximum pulse loading situation within the STLM was reinvestigated. The results reflect two types of pulse loading interactions: air to ground loading and ground to air loading. The interrogation loading on a transponder with the desired signal interrogator (aircraft) at 22 and 7 nmi for channels 24x and 90y, respectively, is provided in tables. The loading is separated vertically into that which comes from cofrequency or adjacent-frequency undesired sources and whether the interfering interrogators are operating in the enroute or precision mode. The horizontal separation of the data in the tables reflects the relative power level between the desired and undesired interrogations at the transponder receiver input terminals. The tabulated results are analyzed. J.M.S.

N83-14098*# BioTechnology, Inc., Falls Church, Va.
A FLIGHT INVESTIGATION OF SIMULATED DATA-LINK COMMUNICATIONS DURING SINGLE-PILOT IFR FLIGHT. VOLUME 2: FLIGHT EVALUATIONS Final Report
James F. Parker, Jr. and Jack W. Duffy Washington NASA Nov. 1982 75 p refs
(Contract NAS1-16037)
(NASA-CR-3653; NAS 1.26:3653) Avail: NTIS HC A04/MF A01 CSCL 17G

Key problems in single pilot instrument flight operations are in the management of flight data and the processing of cockpit information during conditions of heavy workload. A flight data console was developed to allow simulation of a digital data link to replace the current voice communications stem used in air traffic control. This is a human factors evaluation of a data link communications system to determine how such a system might reduce cockpit workload, improve flight proficiency, and be accepted by general aviation pilots. The need for a voice channel as backup to a digital link is examined. The evaluations cover both airport terminal area operations and full mission instrument flight. Results show that general aviation pilots operate well with a digital data link communications system. The findings indicate that a data link system for pilot/ATC communications, with a backup voice channel, is well accepted by general aviation pilots and is considered to be safer, more efficient, and result in less workload than the current voice system. S.L.

N83-14099# Federal Aviation Administration, Washington, D.C. Office of Systems Engineering Management.
SUMMARY OF THE FAA'S FUTURE NAVIGATION SYSTEM MIX EVALUATION, THROUGH MAY 1982
T. H. Higgins, K. D. McDonald, P. D. Blythe, L. H. Hogle, R. Braff, and A. Winick Aug. 1982 53 p refs
(AD-A119314; DOT/FAA-EM-82-24) Avail: NTIS HC A04/MF A01 CSCL 17/7

This document summarizes the activities of the Federal Aviation Administration (FAA) is formulating preliminary recommendations for the navigation system or system mix that best meets civil aviation navigation requirements of the post-1995 time period. This activity is part of the FAA program described in the Federal Radionavigation Plan (FRP). The FRP specifies that a joint Department of Transportation (DoT)/Department of Defense (DoD) initial recommendation be made on the future radionavigation system mix during 1983 and that a final decision be made in 1986. The 1986 decision will then become the basis for future civil/military navigational system implementation. Author (GRA)

N83-14100# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
LOW ALTITUDE NAVIGATION AUGMENTATION SYSTEM Final Technical Report, Sep. 1980 - Aug. 1981
D. Alexander Koso Wright-Patterson AFB, Ohio AFWAL Dec. 1981 114 p
(Contract F33615-80-C-1209; AF Proj. 6095)
(AD-A119700; CSDL-R-1526; AFWAL-TR-81-1222) Avail: NTIS HC A06/MF A01 CSCL 17/7

The Low Altitude Navigation Augmentation Concept provides the pilot with an electronic map display on the aircraft's HUD, so that head down operations (looking at maps or moving map displays) are not required. In addition to the display concept, bearing measurements to known landmarks can be utilized to update the navigation system and also to estimate errors between the navigation system coordinate frame and the map coordinate frame. The concept for the LANA was developed by CSDL under IR&D funding to determine the lowest performance INS usable in the LANA configuration. The simulation configuration described in this plan, however, utilizes higher performance equipment; since the higher performance equipment will be procured for the F-16 and A-10 aircraft. In this report, a plan is developed to simulate the LANA concept on an Air Force simulator. The simulation will be used to verify both system performance and pilot work load under realistic flight conditions. GRA

N83-14101# Naval Postgraduate School, Monterey, Calif.
A SENSITIVITY ANALYSIS OF THE KALMAN FILTER AS APPLIED TO AN INERTIAL NAVIGATION SYSTEM M.S. Thesis
Gary Glen Potter Jun. 1982 105 p refs
(AD-A119623) Avail: NTIS HC A06/MF A01 CSCL 12/1

A tactical missile with mid-course requires the use of an Inertial Navigation System (INS). Steady-state Kalman Filters (SKF) used as estimators have been proposed for use in a Strapdown INS that is considered to be cheaper and easier to implement than a gimbaled INS. This thesis further investigates the sensitivity of the SKF to inaccuracies in the filter parameters such as the dimensional stability derivatives. The analysis is expanded to explore the sensitivity of a system of higher dimension created by the augmentation of an additional state. The study has been performed by independently varying each of the filter parameters over a given range and noting the effect on the accuracy of the filter. One of the benefits of this analysis of the rms estimate errors to variations in the stability derivatives is that it reveals which derivatives need to be accurately determined to ensure stable flight. Author (GRA)

N83-14102# Salford Univ. (England). Dept. of Aeronautical and Mechanical Engineering.
DESIGN OF HIGH-PERFORMANCE TRACKING SYSTEMS Technical Report, 15 Nov. 1980 - 30 Sep. 1981
Brian Porter Wright-Patterson AFB, Ohio AFWAL 1 Jul. 1982 174 p refs
(Contract F49620-81-C-0026; AF Proj. 2304)
(AD-A119440; USAME/DC/120-81; AFWAL-TR-82-3032) Avail: NTIS HC A08/MF A01 CSCL 17/7

Conceptually and computationally simple methods for the design of high-performance tracking systems are described. These methods are equally applicable to the design of both analogue and digital controllers, and are based upon the exploitation of a solitary system-theoretic result from the singular perturbation analysis of transfer function matrices. Illustrative examples involving the design of tracking systems incorporating both high-gain analogue controllers and fast-sampling digital controllers are presented. Author (GRA)

N83-14103# IIT Research Inst., Annapolis, Md.
EMC ANALYSIS OF A PROTOTYPE CIVIL-USE GPS RECEIVER ON FOUR AIRCRAFT CONFIGURATIONS
Robert L. Mullen Jul. 1982 73 p refs
(Contract F19628-80-C-0042; AF Proj. 649E)
(AD-A119578; FAA-RD-82-63; FCAC-CR-82-048) Avail: NTIS HC A04/MF A01 CSCL 17/7

The analysis for each aircraft addressed the potential of interference from adjacent-signal and out-of-band transmitters. Adjacent-signal transmitters aboard the four aircraft configurations consisted of Distance Measuring Equipment interrogators, Air Traffic Control Radar Beacon System transponders, Mode S transponders, and Traffic Alert and Collision Avoidance System interrogators. The out-of-band transmitters included HF, VHF, and UHF communications equipment. The electromagnetic compatibility aspects of the GPS receiver that were examined included burnout and saturation of the limiting diode in the receiver front end, interference to signal acquisition, and interference to signal code and carrier tracking. Only radiated interference coupled from the transmit antenna to the receive antenna was examined in this analysis. Conducted interference was not considered. For the specific configurations analyzed, no potential instances of burnout or saturation of the limiting diode due to signals from individual or multiple on-board transmitters were identified. For the specific configurations analyzed, no potential instances were identified in which the interfering signal from an individual on-board transmitter exceeded the GPS interference thresholds. For the specific configurations analyzed, one potential instance was identified in which the composite interfering signal from multiple on-board transmitters exceeded the GPS interference threshold for C/A signal acquisition. Alternative actions were recommended to preclude the occurrence of interference to the GPS receiver. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-14104# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

OPERATIONAL LOADS MEASUREMENT AND EVALUATION
Sep. 1982 23 p refs
(AGARD-R-704; ISBN-92-835-1435-0) Avail: NTIS HC A02/MF A01

Design loads and fatigue analysis, and differing approaches to one determination of operational loads and structural stresses are characterized. Author

N83-14105*# Sikorsky Aircraft, Stratford, Conn.
COUPLED ROTOR/AIRFRAME VIBRATION ANALYSIS Final Report
Robert Sopher, R. E. Studwell, S. Cassarino, and S. B. R. Kottapalli Washington NASA Nov. 1982 205 p refs Sponsored in part by Army Aviation Research and Development Command
(Contract NAS1-16058)
(NASA-CR-3582; ; NAS 1.26:3582) Avail: NTIS HC A10/MF A01 CSCL 01C

A coupled rotor/airframe vibration analysis developed as a design tool for predicting helicopter vibrations and a research tool to quantify the effects of structural properties, aerodynamic interactions, and vibration reduction devices on vehicle vibration levels is described. The analysis consists of a base program utilizing an impedance matching technique to represent the coupled rotor/airframe dynamics of the system supported by inputs from several external programs supplying sophisticated rotor and airframe aerodynamic and structural dynamic representation. The theoretical background, computer program capabilities and limited correlation results are presented in this report. Correlation results using scale model wind tunnel results show that the analysis can adequately predict trends of vibration variations with airspeed and higher harmonic control effects. Predictions of absolute values of vibration levels were found to be very sensitive to modal characteristics and results were not representative of measured values. Author

N83-14106# Aeronautical Research Labs., Melbourne (Australia).
DIGITAL FILTERING OF HELICOPTER FLIGHT DATA
N. E. Gilbert and J. A. Fleming Jan. 1982 27 p refs
(ARL-Aero-Note-406; AR-002-330) Avail: NTIS HC A03/MF A01

Data obtained during flight trials on a Sea King Mk. 50 helicopter contained significant noise, especially in measurements of components of linear acceleration and angular velocity. Two digital Butterworth low pass filters were designed and their effect demonstrated. Direct representation of the transfer function as a high order filter is used, in preference to representation as a number of second order and first order subfilters. The mathematical derivation of the filter coefficients is given in direct form. Author

N83-14107*# Rockwell International Corp., Los Angeles, Calif.
A NASTRAN MODEL OF A LARGE FLEXIBLE SWING-WING BOMBER. VOLUME 1: NASTRAN MODEL PLANE Final Report
W. D. Mock Sep. 1982 125 p refs 5 Vol.
(Contract NAS4-2308)
(NASA-CR-170392-Vol-1; NAS 1.26:170392-Vol-1;
NA-76-469-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 01C

A review was conducted of B-1 aircraft no. 2 (A/C-2) internal loads models to determine the minimum model complexity necessary to fulfill all of the airloads research study objectives. Typical model sizings were tabulated at selected vehicle locations, and scale layouts were prepared of the NASTRAN structural analysis model. Author

N83-14108*# Rockwell International Corp., Los Angeles, Calif.
A NASTRAN MODEL OF A LARGE FLEXIBLE SWING-WING BOMBER. VOLUME 2: NASTRAN MODEL DEVELOPMENT-HORIZONTAL STABILZER, VERTICAL STABILIZER AND NACELLE STRUCTURES Final Report
W. D. Mock, R. A. Latham, and E. D. Tisher Sep. 1982 304 p refs 5 Vol.
(Contract NAS4-2348)
(NASA-CR-170392-Vol-2; NAS 1.26:170392-Vol-2;
NA-76-469-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 01C

The NASTRAN model plans for the horizontal stabilizer, vertical stabilizer, and nacelle structure were expanded in detail to generate the NASTRAN model for each of these substructures. The grid point coordinates were coded for each element. The material properties and sizing data for each element were specified. Each substructure model was thoroughly checked out for continuity, connectivity, and constraints. These substructures were processed for structural influence coefficients (SIC) point loadings and the deflections were compared to those computed for the aircraft detail models. Finally, a demonstration and validation processing of these substructures was accomplished using the NASTRAN finite element program installed at NASA/DFRC facility. Author

N83-14109*# Rockwell International Corp., Los Angeles, Calif.
A NASTRAN MODEL OF A LARGE FLEXIBLE SWING-WING BOMBER. VOLUME 3: NASTRAN MODEL DEVELOPMENT-WING STRUCTURE Final Report
W. D. Mock and R. A. Latham Sep. 1982 202 p refs 5 Vol.
(Contract NAS4-2432)
(NASA-CR-170392-Vol-3; NAS 1.26:170392-Vol-3;
NA-76-469-Vol-3) Avail: NTIS HC A10/MF A01 CSCL 01C

The NASTRAN model plan for the wing structure was expanded in detail to generate the NASTRAN model for this substructure. The grid point coordinates were coded for each element. The material properties and sizing data for each element were specified. The wing substructure model was thoroughly checked out for continuity, connectivity, and constraints. This substructure was processed for structural influence coefficients (SIC) point loadings and the deflections were compared to those computed for the aircraft detail model. Finally, a demonstration and validation processing of this substructure was accomplished using the NASTRAN finite element program. The bulk data deck, stiffness matrices, and SIC output data were delivered. Author

N83-14110*# Rockwell International Corp., Los Angeles, Calif.
A NASTRAN MODEL OF A LARGE FLEXIBLE SWING-WING BOMBER. VOLUME 4: NASTRAN MODEL DEVELOPMENT-FUSELAGE STRUCTURE Final Report
W. D. Mock and R. A. Latham Sep. 1982 245 p refs
(Contract NAS4-2533)
(NASA-CR-170392-Vol-4; NAS 1.26:170392-Vol-4;
NA-76-469-Vol-4) Avail: NTIS HC A11/MF A01 CSCL 01C

The NASTRAN model plan for the fuselage structure was expanded in detail to generate the NASTRAN model for this substructure. The grid point coordinates were coded for each element. The material properties and sizing data for each element were specified. The fuselage substructure model was thoroughly checked out for continuity, connectivity, and constraints. This substructure was processed for structural influence coefficients (SIC) point loadings and the deflections were compared to those computed for the aircraft detail model. Finally, a demonstration and validation processing of this substructure was accomplished using the NASTRAN finite element program. The bulk data deck, stiffness matrices, and SIC output data were delivered. Author

N83-14111*# Rockwell International Corp., Los Angeles, Calif.
A NASTRAN MODEL OF A LARGE FLEXIBLE SWING-WING BOMBER. VOLUME 5: NASTRAN MODEL DEVELOPMENT-FAIRING STRUCTURE Final Report
W. D. Mock and R. A. Latham Sep. 1982 105 p refs 5 Vol.
(Contract NAS4-2614)
(NASA-CR-170392-Vol-5; NAS 1.26:170392-Vol-5;
NA-76-469-Vol-5) Avail: NTIS HC A06/MF A01 CSCL 01C

The NASTRAN model plan for the fairing structure was expanded in detail to generate the NASTRAN model of this substructure. The grid point coordinates, element definitions, material properties, and sizing data for each element were specified. The fairing model was thoroughly checked out for continuity, connectivity, and constraints. The substructure was processed for structural influence coefficients (SIC) point loadings to determine

the deflection characteristics of the fairing model. Finally, a demonstration and validation processing of this substructure was accomplished using the NASTRAN finite element program. The bulk data deck, stiffness matrices, and SIC output data were delivered. Author

N83-14112# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE MANUFACTURE OF INTERIOR DECORATION WALL PLATES FOR THE YIER-86 AIRCRAFT
Qu Luzhou 5 Aug. 1982 12 p Transl. into ENGLISH from Guoji Hangkong (China), no. 12, Dec. 1981 p 15, 40-41
(AD-A118962; FTD-ID(RS)T-0520-82) Avail: NTIS HC A02/MF A01 CSCL 01/3

The fabrication of honeycomb sandwich structure interior decoration wall plates for the YIER-86 aircraft is discussed. Materials and forming techniques are discussed. R.J.F.

N83-14113# Ship Systems, Inc., San Diego, Calif.
PRELAUNCH SURVIVABILITY OF GROUND LAUNCHED CRUISE MISSILE (GLCM). VOLUME 3: SAVAGE CODE VERSION 1.0 USER'S GUIDE Final Report, 1 Jul. 1979 - 20 Jun. 1980
Gary G. Erickson, George E. Jacobssen, Jr., Kenneth G. Hamilton, John F. Brown, and Edwin M. Crow 20 Jun. 1980 58 p
(Contract DNA001-79-C-0415)
(AD-A119023; SSI-80-203(S)-Vol-3; DNA-5350F-3) Avail: NTIS HC A04/MF A01 CSCL 09/2

This manual represents an unclassified user handbook for the SAVAGE (Survivability and Vulnerability Assessment of GLCM Elements) deterministic computer program. The manual represents Volume 3 of a three volume set; Volume 1 details the data base that was developed to support SAVAGE, while Volume 2 addresses the architecture and modeling included in SAVAGE. Author (GRA)

N83-14114# McDonnell Aircraft Co., St. Louis, Mo.
PICTORIAL FORMATS. VOLUME 3: LITERATURE REVIEW Final Technical Report, period ending Aug. 1981
T. J. Quinn Wright-Patterson AFB, Ohio AFWAL Mar. 1982 195 p refs
(Contract F33615-80-C-3601; AF Proj. 2403)
(AD-A119223; MDC-A7172-Vol-3; AFWAL-TR-81-3156-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 14/2

This literature review examines previously designed display concepts. These displays represent ideas developed over the last three decades. Specifics include the Army-Navy Instrumentation Program (ANIP) that commenced in the early 1950's and led into the Joint Army-Navy Aircraft Instrumentation Program (JANTR) in the 1960's. Although many of these display formats were never flown in an aircraft because of the lack of a display medium, they were compiled to serve as an excellent data base for the development of new display formats. A bibliography of over 150 sources is presented. GRA

N83-14115# McDonnell Aircraft Co., St. Louis, Mo.
PICTORIAL FORMATS. VOLUME 1: FORMAT DEVELOPMENT Final Technical Report, May 1980 - May 1981
R. A. Jauer and T. J. Quinn Wright-Patterson AFB, Ohio AFWAL Feb. 1982 129 p
(Contract F33615-80-C-3601; AF Proj. 2403)
(AD-A119222; MDC-A7172-Vol-1; AFWAL-TR-81-3156-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 14/2

The development of displays for six primary fighter crew stations functions (e.g., primary flight, tactical situation, stores management, systems status, engine status, and emergency procedures is considered with emphasis on information that the pilot really needs. Possible changes in cockpit requirements reflecting future aircraft systems and performance were examined. Pictorial formats were generated in monochrome stroke, color stroke and color raster. The color raster formats are the most aesthetically pleasing. The study indicates that pictorial formats should include limited use of alpha-numeric characters to add to the precision that certain situations/systems require. The use of color was found to enhance information transfer in situations where the pilot must distinguish between classes of stimuli. Author (GRA)

N83-14116# Logistics Management Inst., Washington, D. C.
IMPROVING ENERGY EFFICIENCY OF MAJOR WEAPON SYSTEMS Final Report
Donna J. S. Peterson and Connelly D. Stevenson Jul. 1982 50 p refs
(Contract MDA903-81-C-0166)
(AD-A119563; LMI-ML111) Avail: NTIS HC A03/MF A01 CSCL 21/4

The increasing cost of fuel consumed by major weapon systems is a continuing concern for the Department of Defense (DoD). Because fuel costs are growing more rapidly than other Operating and Support (O&S) costs, they are consuming a growing fraction of the O&S budget. One solution to the problem is to place greater emphasis on acquiring energy efficient weapon systems. The efficient use of energy in major systems will help assure that the DoD will get the highest level of performance for every fuel dollar spent. The major system acquisition process serves as the framework for incorporating energy efficiency into system design and development. Not all systems are energy intensive and not all would benefit from increased attention to energy. This report defines a method for determining which systems are energy intensive using an energy consumption threshold specific to the warfare area of the system under consideration. We recommend that systems designated energy intensive be subjected to a more detailed analysis of energy consumption and cost, including the sensitivity of system life cycle costs to changes in energy costs. The report provides a case study to demonstrate how the recommended analytical methods can be performed within the life cycle cost analysis required for major weapon systems. Author (GRA)

N83-14117# Calspan Corp., Buffalo, N. Y. Flight Research Dept.
EQUIVALENT SYSTEM VERIFICATION AND EVALUATION OF AUGMENTATION EFFECTS ON FIGHTER APPROACH AND LANDING FLYING QUALITIES. VOLUME 2: PROGRAM PLAN, TEST DATA AND ANALYSIS Final Report, Jul 1978 - Jul. 1981
Rogers E. Smith, John Hodgkinson, and Richard C. Snyder Wright-Patterson AFB, Ohio AFWAL Sep. 1981 375 p refs Prepared in cooperation with McDonnell Aircraft Co., St. Louis 2 Vol.
(Contract F33615-78-C-3602; AF Proj. 2403)
(AD-A119704; CALSPAN-6241-F-3-Vol-2; AFWAL-TR-81-3116-Vol-2) Avail: NTIS HC A16/MF A01 CSCL 01/2

An approach and landing evaluation program was performed using the AFWAL/Calspan NT-33 variable stability aircraft to test the suitability of representing aircraft with complex flight control systems by an equivalent simplified system. An evaluation of the equivalent systems includes effects of time delay, correlation with Pilot Ratings and comparison of frequency response characteristics for both high order and low order configurations. The analytical descriptions of the configurations have been plotted in Bode diagrams with the corresponding step time histories. The effects of gain parameters on the matching equivalent systems are presented. A fast Fourier Transform method has been applied to flight time histories for analysis in the frequency response mode. The resulting response characteristics also serve as a check on the predicted responses as defined by the analytical descriptions programmed in the NT-33. The equivalent systems data have been evaluated with the Neal and Smith closed-loop analysis technique. For the longitudinal evaluations, the validity of the equivalent system approach for evaluation of the flying qualities of complex aircraft was generally verified. The data for the lateral equivalent system evaluations were inconclusive. Author (GRA)

N83-14118# Naval Postgraduate School, Monterey, Calif.
HP-41CV FLIGHT PERFORMANCE ADVISORY SYSTEM (FPAS)

FOR THE E-2C, E-2B AND C-2A AIRCRAFT Final Technical Report, Apr. - Jun. 1982
Dennis R. Ferrell Jun. 1982 153 p refs
(AD-A119580; NPS67-82-003) Avail: NTIS HC A08/MF A01 CSCL 21/4

This report describes follow-on work performed under the auspices of AE 4900, Directed Studies in Aeronautical Engineering at the Naval Postgraduate School, to complement the original design of a Flight Performance Advisory System (FPAS) for the E-2C aircraft. The original design fulfilled the requirements of AE 3001, Aircraft Energy Conservation. AE 3001, offered in the Fall Quarter 1981, and conducted by Professor Allen E. Fuhs, was sponsored in part by the Naval Air Development Center (NADC). NADC desired to obtain the input of several fleet experienced aviators in order to design program code for the HP-41CV handheld, programmable calculator that would benefit pilots by providing them with fuel efficiency parameters in flight. Calculators were made available to the participants with the proviso that a completed and operable code for each aircraft be submitted by the end of the academic quarter, September 1981. Upon completion of the E-2C program, attempts were made to use the calculator in flight. One test was conducted informally in an E-2C at RVAW-110, NAS Miramar. Unfortunately, the voltage field induced in the cockpit by the main lobe of the radar passing over the cockpit caused the calculator to cease functioning. The need to devise shielding for the calculator, plus the desire to simplify and improve the existing code lead to this effort. GRA

N83-14119# Air Force Flight Test Center, Edwards AFB, Calif. Airframe Systems Div.
DEVELOPMENT OF CURVES FOR ESTIMATING AIRCRAFT ARRESTING HOOK LOADS Final Report
Lyle W. Jones Jul. 1982 72 p refs
(AD-A119551; AFFTC-TIM-81-3) Avail: NTIS HC A04/MF A01 CSCL 01/3

This Technical Information Memorandum was written to provide AFFTC engineers with a reliable, accurate method for predicting maximum aircraft arresting hook loads based on a knowledge of aircraft weight and groundspeed at the moment of cable engagement. Possible causes of excessive data dispersion are discussed and guidelines for minimizing dispersion are provided. Families of curves relating hook load and groundspeed which fit BAK-12ER and BAK-13 arresting system test data are derived and confidence intervals are applied. The information provided in this TIM will be of interest to those involved with the design, fabrication, testing and/or operation of aircraft arresting systems. Author (GRA)

N83-14120# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
BACKGROUND INFORMATION AND USER GUIDE FOR MIL-F8785C, MILITARY SPECIFICATION, FLYING QUALITIES OF PILOTED AIRPLANES Interim Report, May 1977 - May 1981
David J. Moorehouse and Robert J. Woodcock Jul. 1982 255 p refs
(AD-A119421; AFWAL-TR-81-3109) Avail: NTIS HC A12/MF A01 CSCL 01/3

This document is published in support of Military Specification MIL-F-8785C, Flying Qualities of Piloted Airplanes. It was compiled after an extensive literature review and meetings and discussions with personnel from concerned civilian and governmental organizations. The primary purpose is to explain the revisions from MIL-F-8785B and present substantiating data. Author (GRA)

N83-14121# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
A DIVE PERFORMANCE COMPUTER PROGRAM Final Report
David Bruce Fobus 24 May 1982 72 p refs
(AD-A119407; NADC-82012-60) Avail: NTIS HC A04/MF A01 CSCL 01/2

A computer program has been developed which is capable of analyzing the dive performance of any general air vehicle configuration. This program can be used to determine if vehicle design critieria can be met under a dive condition. This program was written in FORTRAN VERSION 4.8 LEVEL 518 for use on a CYBER computer and uses four supporting subroutines. This report describes the analytical development and logic development for the program. In addition, it includes a user description and complete listing of the program. Author (GRA)

N83-14122# Calspan Corp., Buffalo, N. Y.
EQUIVALENT SYSTEM VERIFICATION AND EVALUATION OF AUGMENTATION EFFECTS ON FIGHTER APPROACH AND LANDING FLYING QUALITIES. VOLUME 1: SUMMARY Final Report, Jul. 1978 - Jul. 1981
John Hodgkinson, Richard C. Snyder, and Rogers E. Smith Sep. 1981 43 p
(Contract F33615-78-C-3602; AF Proj. 2403)
(AD-A119406; C-6241-F-3-Vol-1; AFWAL-TR-81-3116-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 01/2

This executive summary reports an analysis of an approach and landing evaluation program using the AFWAL/Calspan NT-33 variable stability aircraft to test the suitability of representing aircraft with complex flight control systems by an equivalent simplified system. An evaluation of the equivalent systems includes effects of time delay, correlations with Pilot Ratings and comparison of frequency response characteristics for both high-order and low-order configurations. Analytical and fast Fourier transform Bode diagrams of the configurations have been plotted with the corresponding step time histories. The effects of gain parameters on the matching of equivalent systems are presented. The resulting response characteristics also serve as a check on the predicted responses as defined by the analytical descriptions programmed in the NT-33. The equivalent systems data have been evaluated with the Neal and Smith closed-loop analysis technique. For the longitudinal evaluations, the validity of the equivalent system approach for evaluation of the flying qualities of complex aircraft was generally verified. The data for the lateral equivalent system evaluations were inconclusive. Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N83-14123*# Ideal Research, Inc., Rockville, Md.
DEVELOPMENT AND TEST OF A MICROWAVE ICE ACCRETION MEASUREMENT INSTRUMENT (MIAMI) Final Report
Bertram Magenheim and James K. Rocks Washington NASA Nov. 1982 85 p refs
(Contract NAS3-22765)
(NASA-CR-3598; NAS 1.26:3598; BATT-92880) Avail: NTIS HC A05/MF A01 CSCL 01D

The development of an ice accretion measurement instrument that is a highly sensitive, accurate, rugged and reliable microprocessor controlled device using low level microwave energy for non-instrusive real time measurement and recording of ice growth history, including ice thickness and accretion rate is discussed. Data is displayed and recorded digitally. New experimental data is presented, obtained with the instrument, which demonstrates its ability to measure ice growth on a two-dimensional airfoil. The device is suitable for aircraft icing protection. It may be mounted flush, non-intrusively, on any part of an aircraft skin including rotor blades and engine inlets. R.J.F.

N83-14124# Naval Training Equipment Center, Orlando, Fla. Advanced Simulation Concepts Lab.
HELMET MOUNTED DISPLAY FEASIBILITY MODEL: OPTICAL DESIGN Final Report, Aug. 1979 - May 1982
Eugene D. Maldonato Jul. 1982 26 p refs
(AD-A119191; NAVTRAEQUIPC-IH-340) Avail: NTIS HC A03/MF A01 CSCL 14/2

This report describes the optical design of a Feasibility Model

Laser Projector Helmet Mounted Display for visual simulation in flight training. The feasibility model was designed to evaluate the Laser Projection Concept and serve as a test bed to determine required performance parameters for an advanced system.
Author (GRA)

N83-14125# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
CALIBRATION FACILITIES FOR FLIGHT TEST EQUIPMENT
A. W. B. Kalshoven May 1981 28 p refs Presented at 4th AGARD Special Course on Flight Test Instrumentation, Delft, May 1981
(NLR-MP-81029-U) Avail: NTIS HC A03/MF A01

The basic considerations which should be followed in the design of a calibration system are given. The treatment and propagation of measurement errors are considered. A case study of an automatic pressure calibration system is given. Author (ESA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-14126*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UNIFORM ENGINE TESTING PROGRAM. PHASE 1: NASA LEWIS RESEARCH CENTER PARTICIPATION
T. Blesiadny, L. Burkardt, and W. Braithwaite Oct. 1982 63 p refs
(NASA-TM-82978; E-1407; NAS 1.15:82978) Avail: NTIS HC A04/MF A01 CSCL 21E

Two jet engines were tested under identical conditions in a variety of altitude and ground level facilities as a means to correlating these facilities. Two J57-19W turbojet engines were tested in an altitude test facility. The test results are summarized.
S.L.

N83-14127*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL CALCULATION OF A SINGLE JET IN CROSSFLOW AND COMPARISON WITH EXPERIMENT
Russell W. Clauss 1982 15 p refs Proposed for presentation at the 21th Aerospace Sci. Conf., Reno, Nev., 10-13 1983; sponsored by AIAA
(NASA-TM-83027; E-1462; NAS 1.15:83027) Avail: NTIS HC A02/MF A02 CSCL 21E

A series of calculations of a jet in crossflow using a three-dimensional finite difference model of the Navier-Stokes equations were made on a series of progressively finer grids. With a reasonable number of grid point (40x30x20), calculated jet penetration and mixing characteristics were found to compare favorably with the experimental measurements of Crabb, Durao and Whitelaw. The calculated results were grid dependent (i.e., numerical or false diffusion was present in the result). A finer grid calculation indicated that turbulence model deficiencies may become more noticeable in the calculated results as the magnitude of numerical diffusion is reduced. Author

N83-14128*# United Technologies Corp., East Hartford, Conn. Commercial Products Div.
ROTOR REDESIGN FOR A HIGHLY LOADED 1800 FT/SEC TIP SPEED FAN. 3: LASER DOPPLER VELOCIMETER REPORT Final Report
W. B. Harvey, D. E. Hobbs, D. Lee, M. C. Williams, and K. F. Williams Apr. 1982 258 p refs
(Contract NAS3-20591)
(NASA-CR-167954; NAS 1.26:167954; PWA-5523-122) Avail: NTIS HC A12/MF A01 CSCL 21E

Laser Doppler velocimeter (LDV) techniques were employed for testing a highly loaded, 550 m/sec (1800 ft/sec) tip speed, test fan stage, the objective to provide detailed mapping of the upstream, intrablade, and downstream flowfields of the rotor. Intrablade LDV measurements of velocity and flow angle were obtained along four streamlines passing through the leading edge at 45%, 69%, 85%, and 95% span measured from hub to tip, at 100% of design speed, peak efficiency; 100% speed, near surge; and 95% speed, peak efficiency. At the design point, most passages appeared to have a strong leading edge shock, which moved forward with increasing strength near surge and at part speeds. The flow behind the shock was of a complex mixed subsonic and supersonic form. The intrablade flowfields were found to be significantly nonperiodic at 100% design speed, peak efficiency. Author

N83-14129*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TIP CAP FOR A ROTOR BLADE Patent Application
William K. Koffel (GE, Cincinnati, Ohio), Eugene N. Tuley (GE, Cincinnati, Ohio), Charles H. Gay, Jr. (GE, Cincinnati, Ohio), Raymond E. Troeger (GE, Cincinnati, Ohio), and Albert P. Sterman, inventors (to NASA) (GE, Cincinnati, Ohio) Filed 20 Mar. 1981 19 p Sponsored by NASA
(NASA-Case-LEW-13654-1; US-Patent-Appl-SN-245571) Avail: NTIS HC A02/MF A01 CSCL 21E

A replaceable tip cap for a rotor blade is disclosed. The tip cap is comprised of a plurality of walls for defining a compartment. The tip cap is attachable to the radially outer end of the rotor blade and may be divided into a plurality of subcompartments. A flow of cooling fluid is introduced through inlet holes in the radially inner wall of the tip cap. The fluid exists through outlet holes in a sidewall. The tip cap design provides for reduced overheating and increased tip cap life as well as increased wear resistance to reduce the rate of engine efficiency loss. NASA

N83-14130*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPARATUS AND METHOD FOR IMPROVING THE FUEL EFFICIENCY OF A GAS TURBINE ENGINE Patent Application
George A. Coffinberry, inventor (to NASA) (General Electric Co., Cincinnati, Ohio) Filed 20 Mar. 1980 15 p Sponsored by NASA
(NASA-Case-LEW-13142-1; US-Patent-Appl-SN-132364) Avail: NTIS HC A02/MF A01 CSCL 21E

An energy recovery system is provided for an aircraft gas turbine engine of the type in which some of the pneumatic energy developed by the engine is made available to support systems such as an environmental control system. In one such energy recovery system, some of the pneumatic energy made available to but not utilized by the support system is utilized to heat the engine fuel immediately prior to the consumption of the fuel by the engine. Some of the recovered energy may also be utilized to heat the fuel in the fuel tanks. Provision is made for multiengine applications wherein energy recovered from one engine may be utilized by another one of the engines or systems associated therewith. NASA

N83-14131# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
CURVATURE EFFECTS ON THE HEAT TRANSFER PERFORMANCE OF THREE-DIMENSIONAL FILM COOLING OF GAS TURBINE BLADES Final Report, 25 Jun. 1979 - 24 Jun. 1982
E. R. G. Eckert and R. J. Goldstein Aug. 1982 65 p refs
(Contract DAAG29-79-C-0117)
(AD-A119729; ARO-16595.6-EG) Avail: NTIS HC A04/MF A01 CSCL 21/5

Film cooling is used extensively for the blades of high-performance, high-temperature gas turbines, especially for aircraft turbines. In this method, a film of coolant is injected into the boundary layer covering the skin of the blades and creating a cool layer which separates the blade surface from the hot gas

stream and, in this way, reduces the blade temperature. For best performance the coolant should be injected through a slot or a strip of porous material. This, however, is not possible for turbine blades because of strength considerations, and the coolant is injected through one or several rows of holes. For aircraft gas turbines, air is used as a coolant. The present investigation, therefore, is concerned with the cooling performance of film cooling when cooling air is injected into the boundary through one or two rows of holes. A standard configuration of the coolant holes is used because it has been used in previous investigations and because configurations in actual turbine blades are close to it. The cooling holes are arranged at a distance apart equal to three times the hole diameter. For injection through two rows of holes, the two rows are staggered and the centers of the holes are on the corners of equilateral triangles. The channels which end at the blade skin in the cooling holes are inclined by an angle of 35 deg against the skin surface in the downstream direction. GRA

N83-14132# Elektroschmelzwerk Kenpten G.m.b.H., Munich (West Germany).
DEVELOPMENT AND FABRICATION OF REFRACTORY BODIES FOR GAS TURBINE ENGINES Final Report, Nov. 1980
Klaus Hunold, Wolfgang Grellner, Jochen Kriegesmann, Alfred Lipp, and Klaus Reinmuth Bonn Bundesministerium fuer Forschung und Technologie Jul. 1982 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-138; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,50

Two hot pressed silicon carbides materials were developed. One (HP-T) is characterized by a constant strength from room temperature up to high temperatures. Silicon carbide powders for hot pressing can be produced in large quantities. The parameters for hot isostatic pressing (HIP) of silicon carbide powders were evolved. A technique for capsulation was developed. Pressureless sintered and hot pressed parts were post-densified by HIP. Properties of the different silicon carbide materials are evaluated and their potential for the production of gas turbine parts are discussed. Author (ESA)

N83-14133# Keramische Betriebe G.m.b.H., Roedental (West Germany). Geschaeftsbereich Ceranox.
DEVELOPMENT OF HIGH STRENGTH SILICON CARBIDE MATERIALS FOR GAS TURBINE APPLICATIONS, PHASE 2 Final Report, Jul. 1980
Ernst Gugel and Gerhard Leimer Bonn Bundesministerium fuer Forschung und Technologie Jul. 1982 43 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung une Technologie
(BMFT-FB-T-82-140; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9

Pressureless sintered and silicon containing silicon carbides were selected for application in gas turbines. The materials were developed in order to improve mechanical properties, and shaping, and to produce prototype components. Development projects are presented, microstructure and properties are shown, as well as mistakes and further improvements. Nose cones and stators that showed good results as stationary gas leading components were introduced. For the shaping of these parts a special slip casting procedure was developed. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N83-14134# Aeronautical Research Labs., Melbourne (Australia). Structures Dept.
FLUTTER SUBSTANTIATION TESTS ON A TRANSAVIA PL-12/T-300 AIRTRUK
A. Goldman Jun. 1982 74 p ref
(AD-A118895; ARL/STRU-TM-341; AR-002-890) Avail: NTIS HC A04/MF A01 CSCL 01/3

A resonance test and subsequent flight tests have been conducted on a Transavia Airtruk. The natural modes and frequencies of vibration were measured in the ground tests, and attempts made to induce flutter during flight tests. The results of these tests are presented. GRA

N83-14135# Bendix Corp., Teterboro, N. J. Flight Systems Div.
ADVANCED VERIFICATION TESTING OF A DUAL MODE ELECTRO/PNEUMATIC ACTUATOR FOR THE T-2C AIRCRAFT Final Report, Sep. 1978 - Apr. 1981
Wallace Kineyko Apr. 1982 56 p
(Contract N62269-78-C-0247)
(AD-A119003; NADC-82047-60) Avail: NTIS HC A04/MF A01 CSCL 01/3

This is a report of the fabrication and design verification testing of a Dual Mode Electro/Pneumatic Actuator. Pneumatic mode open loop operation and control verified. Torque/Speed performance less than design goal due to excessive gear separation force. GRA

N83-14136# Bendix Corp., Teterboro, N. J. Flight Systems Div.
ADVANCED FLIGHT CONTROL ACTUATION SYSTEM (AFCAS -E/P). FABRICATION AND DESIGN VERIFICATION TESTING OF A DUAL MODE ELECTRO/PNEUMATIC ACTUATOR FOR THE T-2C AIRCRAFT Final Report, Sep. 1978 - Apr. 1981
Wallace Kineyko Warminster, Pa. NADC Apr. 1982 55 p
(Contract N62269-78-C-0247)
(AD-A119627; NADC-82047-60) Avail: NTIS HC A04/MF A01 CSCL 01/3

Report of the fabrication and design verification testing of a Dual Mode Electro/Pneumatic Actuator. Pneumatic model open loop operation and control verified. Torque/Speed performance less than design goal due to excessive gear separation force. Author (GRA)

N83-14137# Naval Postgraduate School, Monterey, Calif.
DYNAMIC STABILITY OF FLIGHT VEHICLES M.S. Thesis
Dimitrios Panagiotis Pouliezos Jun. 1982 257 p refs
(AD-A119637) Avail: NTIS HC A12/MF A01 CSCL 20/4

The thesis presents an analytical treatment of the dynamics of the flight vehicle and might be used as a textbook for a Dynamic Stability and Control advanced class. Concentration is given to derivation of equations of motion, investigation of particular modes of motion, stability derivatives, aerodynamic transfer functions and digital computer solutions. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N83-14138*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADAPTIVE WALL WIND TUNNELS, A SELECTED, ANNOTATED BIBLIOGRAPHY
Marie H. Tuttle (Kentron International Inc.) and Elizabeth B. Plentovich Nov. 1982 38 p
(NASA-TM-84526; L-15497; NAS 1.15:84526) Avail: NTIS HC A03/MF A01 CSCL 14B

This bibliography, with abstracts, consists of 134 citations arranged in chronological order by dates of publication or dates of presentation. Selection of the citations was made for their

relevance to the problems involved in reducing wind tunnel wall interference by the use of adaptive walls. Author

N83-14139*# Shaker Research Corp., Ballston Lake, N. Y.
DIGITAL SYSTEM FOR STRUCTURAL DYNAMICS SIMULATION Final Report
A. I. Krauter, L. J. Lagace, M. K. Wojnar, and C. Glor Nov. 1982 125 p
(Contract NAS3-22546)
(NASA-CR-168019; NAS 1.26:168019; MTI-83TR12) Avail: NTIS HC A06/MF A01 CSCL 14B

State-of-the-art digital hardware and software for the simulation of complex structural dynamic interactions, such as those which occur in rotating structures (engine systems). System were incorporated in a designed to use an array of processors in which the computation for each physical subelement or functional subsystem would be assigned to a single specific processor in the simulator. These node processors are microprogrammed bit-slice microcomputers which function autonomously and can communicate with each other and a central control minicomputer over parallel digital lines. Inter-processor nearest neighbor communications busses pass the constants which represent physical constraints and boundary conditions. The node processors are connected to the six nearest neighbor node processors to simulate the actual physical interface of real substructures. Computer generated finite element mesh and force models can be developed with the aid of the central control minicomputer. The control computer also oversees the animation of a graphics display system, disk-based mass storage along with the individual processing elements. A.R.H.

N83-14140*# Applied Cryogenics and Materials Consultants, New Castle, Del.
POSSIBLE SAFETY HAZARDS ASSOCIATED WITH THE OPERATION OF THE 0.3-M TRANSONIC CRYOGENIC TUNNEL AT THE NASA LANGLEY RESEARCH CENTER
T. J. Webster Oct. 1982 12 p
(NASA Order L-44921-B)
(NASA-CR-166026; NAS 1.26:166026) Avail: NTIS HC A02/MF A01 CSCL 14B

The 0.3 m Transonic Cryogenic Tunnel (TCT) at the NASA Langley Research Center was built in 1973 as a facility intended to be used for no more than 60 hours in order to verify the validity of the cryogenic wind tunnel concept at transonic speeds. The role of the 0.3 m TCT has gradually changed until now, after over 3000 hours of operation, it is classified as a major NASA research facility and, under the administration of the Experimental Techniques Branch, it is used extensively for the testing of airfoils at high Reynolds numbers and for the development of various technologies related to the efficient operation and use of cryogenic wind tunnels. The purpose of this report is to document the results of a recent safety analysis of the 0.3 m TCT facility. This analysis was made as part of an on going program with the Experimental Techniques Branch designed to ensure that the existing equipment and current operating procedures of the 0.3 m TCT facility are acceptable in terms of today's standards of safety for cryogenic systems. Author

N83-14141# Naval Facilities Engineering Command, Alexandria, Va.
AIRFIELD LIGHTING, DESIGN MANUAL 23.1 Final Report
Jul. 1981 42 p
(AD-A119525; NAVFC-DM-23.1) Avail: NTIS HC A03/MF A01 CSCL 13/1

Design criteria for presented for Category Code 136 and are intended for use by experienced architects and engineers. The contents include approach lighting, runway lighting, taxiway lighting; and helipad lightings. Author (GRA)

N83-14142# Naval Facilities Engineering Command, Alexandria, Va.
HELIUM PLANTS AND STORAGE, DESIGN MANUAL 24.2 Final Report
Jun. 1980 25 p
(AD-A119517; NAVFAC-DM-24.2) Avail: NTIS HC A02/MF A01 CSCL 13/8

Basic design guidance for helium storage, repurification, and distribution facilities, Category Code 142, is presented for use by experienced architects and engineers. The contents include helium characteristics, storage data, handling techniques, receiving facilities, working pressures, pipe sizing and strengths, valving, and cleaning and condensing techniques. Author (GRA)

N83-14143# Aeronautical Research Labs., Melbourne (Australia). Aerodynamics Div.
A SET OF FLIGHT DYNAMIC EQUATIONS FOR AIRCRAFT SIMULATION
P. H. Hall Jun. 1982 26 p refs
(AD-A119543; ARL/AERO-TM-339; AR-002-888) Avail: NTIS HC A03/MF A01 CSCL 01/3

The six degrees of freedom dynamic equations of aircraft motion are documented for use in aircraft simulations at ARL. Earth axes are chosen for the integration of the force equations, and body axes for the integration of the moment equations. The use of quaternions to calculate aircraft attitude and associated direction cosines is described. A brief description of an atmospheric data subroutine for use in aircraft simulation is also included. Author (GRA)

N83-14144# Aeronautical Research Labs., Melbourne (Australia). Aero Dept.
DESIGN OF A NEW CONTRACTION, WIDE ANGLE DIFFUSER AND FLOW MANIPULATORS FOR THE LOW SPEED WIND TUNNEL
J. B. Willis and I. A. Hunt Jun. 1982 27 p refs
(AD-A119544; ARL/AERO-TM-340; AR-002-894) Avail: NTIS HC A03/MF A01 CSCL 14/2

It is over forty years since the A.R.L. low speed wind tunnel was built, and the quality of the flow in the test section is inadequate by today's standards. This memorandum describes the design of a new contraction, wide angle diffuser and flow manipulators, to improve the flow in this tunnel. These modifications should substantially improve the velocity distribution and reduce turbulence levels with only a small reduction in top speed of the tunnel. A useful increase in the length of the test section has also been obtained. Author (GRA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N83-14145*# Westech Systems, Inc., Phoenix, Ariz.
BREAD BOARD FLOAT ZONE EXPERIMENT SYSTEM FOR HIGH PURITY SILICON Final Report
Edward L. Kern and Gerald L. Gill, Jr. 17 Jun. 1982 58 p refs
(Contract NAS8-34542)
(NASA-CR-170668; NAS 1.26:170668; JA64) Avail: NTIS HC A04/MF A01 CSCL 22A

A breadboard float zone experimental system has been established at Westech Systems for use by NASA in the float zone experimental area. A used zoner of suitable size and flexibility was acquired and installed with the necessary utilities. Repairs, alignments and modifications were made to provide for dislocation free zoning of silicon. The zoner is capable of studying process parameters used in growing silicon in gravity and is flexible to allow trying of new features that will test concepts of zoning in microgravity. Characterizing the state of the art molten zones of a growing silicon crystal will establish the data base against which improvements of zoning in gravity or growing in microgravity can be compared. 25 mm diameter was chosen as the reference size, since growth in microgravity will be at that diameter or smaller for about the next 6 years. Dislocation free crystals were growtn in the 100 and 111 orientations, using a wide set of growth condi-

tions. The zone shape at one set of conditions was measured, by simultaneously aluminum doping and freezing the zone, lengthwise slabbing and delineating by etching. The whole set of crystals, grown under various conditions, were slabbed, polished and striation etched, revealing the growth interface shape and the periodic and aperiodic natures of the striations. B.W.

N83-14146*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MATERIALS PROCESSING IN SPACE PROGRAM TASKS
Elizabeth Pentecost, comp. (Universities Space Research Association) Sep. 1982 156 p refs
(NASA-TM-82496; NAS 1.15:82496) Avail: NTIS HC A08/MF A01 CSCL 22A

Active research areas as of the end of the fiscal year 1982 of the Materials Processing in Space Program, NASA-Office of Space and Terrestrial Applications, involving several NASA centers and other organizations are highlighted to provide an overview of the program scope for managers and scientists in industry, university, and government communities. The program is described as well as its history, strategy and overall goal; the organizational structures and people involved are identified and each research task is described together with a list of recent publications. The tasks are grouped into four categories: crystal growth; solidification of metals, alloys, and composites; fluids, transports, and chemical processes; and ultrahigh vacuum and containerless processing technologies. A.R.H.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N83-14325*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ERROR ESTIMATION FOR DELTA VLBI ANGLE AND ANGLE RATE MEASUREMENTS OVER BASELINES BETWEEN A GROUND STATION AND A GEOSYNCHRONOUS ORBITER
S. C. Wu *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 8-19 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 22A

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N83-14147# General Accounting Office, Washington, D. C. Mission Analysis and Systems Acquisition Div.
EVALUATION OF NASA COMMENTS ON GAO REPORT MASAD-82-14: CONSOLIDATED SPACE OPERATIONS CENTER LACKS ADEQUATE DOD PLANNING
12 Aug. 1982 7 p refs
(GAO/MASAD-82-43; B-205335) Avail: NTIS HC A02/MF A01; SOD HC $3.25

A consolidated Space Operations Center for the space transportation system is evaluated. Hardware and software requirements are considered. S.L.

N83-14148# General Accounting Office, Washington, D. C. Mission Analysis and Systems Acquisition Div.
THE CONSOLIDATED SPACE OPERATIONS CENTER
Walter H. Sheley, Jr. 24 Jun. 1982 5 p refs
Avail: NTIS HC A02/MF A01

The Consolidated Space Operations Center is discussed. Overall military space planning and its implication for the development of the center are emphasized. Siting criteria and the operational and organizational factors bearing on final site selection, as well as the cost and legal ramifications involved are reviewed. S.L.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N83-14149# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
THE 16-INCH GUN-LAUNCHED ANTI-SATELLITE WEAPON M.S. Thesis
Joseph John Natale Jun. 1982 95 p refs
(ARPA Order 4035)
(AD-A119308; NPS67-82-002) Avail: NTIS HC A05/MF A01 CSCL 19/1

This thesis determined the feasibility of developing a 16-inch, gun-launched anti-satellite weapon. The general performance capability of rocket-and scramjet-boosted, gun-launched vehicles is examined with regards to propelling a miniature homing vehicle to a satellite intercept altitude. Rocket and scramjet boost vehicle performance is modeled and optimum trajectories are determined. A low gun elevation at launch and a pop-up manuever are required to maximize the scramjet boost vehicle acceleration potential. The rocket boost vehicle is capable of intercepting a low altitude satellite without a pop-up manuever from a gun elevation of 45 degrees. Both boost methods provide apogees consistent with the intercept of known Soviet Electronic Intelligence Ocean Reconnaissance satellites, EORSAT, and Radar Ocean Reconnaissance satellites, RORSAT. Author (GRA)

N83-14150# Naval Surface Weapons Center, Dahlgren, Va.
A MATHEMATICAL DESCRIPTION OF THE LOW-ALTITUDE SATELLITE MISSION PLANNING TOOL (LAMP) Final Report
A. D. Parks Jan. 1982 39 p refs
(AD-A119505; NSWC/TR-81-456) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Low-Altitude Mission Planning tool is capable of providing accurate long-term (approx. 90 day) predictions of key Keplerian orbit parameters and related quantities for one or two low-altitude satellites. Analytically modeled averaged variational equations are used to represent the effects of the geopotential oblateness upon satellite motion. Satellite drag perturbations are taken into account using a hybrid drag decay model which accounts for atmospheric oblateness and diurnal density variation. Adjustments to orbital parameters due to thrusting are modeled using analytical results obtained fom the Lagrange Planetary equations when impulsive thrusting is assumed. Propellant mass expenditures can also be obtained. This planning tool has application in the following areas: Operational interruption prediction; Propellant depletion rate studies; Operational flight strategy development; Orbit adjust impact assessment, and General mission planning. Author (GRA)

N83-14151# State Univ. of New York at Buffalo, Amherst.
INVESTIGATION OF POWER PROCESSING TECHNOLOGY FOR SPACECRAFT APPLICATIONS Final Report, 1 May 1981 - 31 Mar. 1982
A. S. Gilmour, Jr. Jun. 1982 35 p refs
(Contract F33615-81-C-2011; AF Proj. 3145)
(AD-A119644; AFWAL-TR-82-2054) Avail: NTIS HC A03/MF A01 CSCL 10/3

This report summarizes an investigation of power processing technology applicable to future satellite electrical power systems. The issues of AC vs DC distribution are addressed as is the optimum distribution voltage. DC distribution is recommended.

Distributions voltage should be as high as practical but less than 270 volts. Author (GRA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N83-14152*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STS PAYLOAD RETENTION SYSTEM CONCEPT
Keith H. Clark Sep. 1982 9 p
(NASA-TM-82505; NAS 1.15:82505) Avail: NTIS HC A02/MF A01 CSCL 22B

A payload retention concept that may be utilized on Space Shuttle missions is investigated. This concept appears to embody all the desirable features for the very demanding requirements for space flight. Desirable features include light weight, low cost, high reliability, excellant load distribution, versatility, and insensitivity to critical alignment. S.L.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N83-14153*# Public Service Satellite Consortium, Denver, Colo.
AN OVERVIEW OF THE COMMUNICATIONS TECHNOLOGY SATELLITE PROJECT: EXECUTIVE SUMMARY Final Report
William Rapp, Dail Ogden, and Darcy Wright Dec. 1982 27 p Sponsored in cooperation with NASA. Lewis Research Center
(Contract NAS5-25005)
(NASA-CR-168010; NAS 1.26:168010) Avail: NTIS HC A03/MF A01 CSCL 17B

An overview of the Communications Technology Satellite (CTS) project, a joint venture between NASA and the Canadian Department of Communications is given. A brief technical description of the CTS spacecraft and its cognate hardware and operations, a history of the CTS project, and a list of the CTS experiments and demonstrations conducted during the course of the project are given. R.J.F.

N83-14328*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE PERFORMANCE OF VLA AS A TELEMETRY RECEIVER FOR VOYAGER PLANETARY ENCOUNTERS
L. J. Deutsch *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 27-39 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09F

N83-14339*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPACT PRESENTATION OF DSN ARRAY TELEMETRY PERFORMANCE
C. A. Greenhall *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 137-142 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-14154 California Univ., Los Angeles.
CONTROLLER DESIGN FOR LARGE SPACE STRUCTURES USING PARAMETER OPTIMIZATION Ph.D. Thesis
Michael Ikuo Miyagi 1982 415 p
Avail: Univ. Microfilms Order No. DA8219736

Due to the large orders associated with accurate models for Large Space Structures, controller design is usually based on reduced order models. Since controller complexity is linked to model size, to obtain a controller of suitable simplicity a simplified model is also required. The methods of the present research are directed toward making the determination of model size independent of controller complexity. This approach is characterized by its objective of minimizing a performance index or cost functional with respect to specified variables or parameters for a given controlled structure and, is often referred to as parameter optimization. The first part of this research addresses the development of a self contained, efficient parameter optimization program. In the second part of this research the extension of parameter optimization to include the optimization of the control or measurement distribution matrices (and, by implication, sensor and actuator placement) in addition to the output feedback gains is made. Dissert. Abstr.

N83-14155 California Univ., Los Angeles.
ROBUST CONTROL SYSTEM DESIGN TECHNIQUES FOR LARGE FLEXIBLE SPACE STRUCTURES HAVING NON-COLOCATED SENSORS AND ACTUATORS Ph.D. Thesis
Rance Selmer Edmunds 1982 123 p
Avail: Univ. Microfilms Order No. DA8219676

The problem of designing robust controllers for elastic systems having non-colocated actuators and sensors addressed. Controllers are found which minimize output error subject to robustness and control effort constraints. An integrated design method is presented which addresses structural/controller modeling and controller design. Reduced order models of the structure are selected for stability and performance analysis. Optimal controller designs are found for low order models which meet robustness and control effort constraints. These designs are evaluated using frequency domain methods, and suboptimal designs are found which retain robustness and improve performance. The resulting suboptimal designs are evaluated using a higher order model and, if necessary, adjusted to ensure that robustness and control effort constraints are satisfied. The design method is illustrated by example.
Dissert. Abstr.

N83-14156# R and D Associates, Arlington, Va.
RESEARCH NEEDS: PRIME-POWER FOR HIGH ENERGY SPACE SYSTEMS Final Report, 26 Oct. 1981 - 31 Jul. 1982
Peter J. Turchi Jun. 1982 100 p refs
(Contract F49260-82-C-0008; AF Proj. 2308)
(AD-A119243; AFOSR-82-0717TR) Avail: NTIS HC A05/MF A01 CSCL 10/2

By the year 2000, an increasingly large portion of our national defense will depend on space-based systems. As part of a broader set of new research initiatives in support of space systems, the Air Force Office of Scientific Research is sponsoring basic research that may be applicable to the development of megawatt-level space prime-power systems. (The emphasis of this particular new initiative is prime-power versus pulsed power including power conditioning, such as fly-wheel or inductive storage, for which there are existing programs.) To assist AFOSR, R and D Associates organized a special conference on prime-power for high-energy space systems,

compiled the proceedings of the conference, and provided a review document identifying basic research areas in support of future space prime-power development. This document is the Appendix of the present report. The intent has been to focus on basic vs applied research and to provide guidance and assistance to prospective researchers. In this last regard, a bibliography of space prime-power is contained in the appended document.

Author (GRA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-14157*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXTENDED PERFORMANCE 8-CM MERCURY ION THRUSTER

Maris A. Mantenieks [1981] 30 p refs Presented at the 16th Intern. Elec. Propulsion Conf., New Orleans, 17-19 Nov. 1982; sponsored by AIAA, Japan Soc. for Aeron. and Space Sci., and Deut. Gesselschaft fuer Luft und Raumfahrt

(NASA-TM-83029; E-1464; NAS 1.15:83029; AIAA-82-1913) Avail: NTIS HC A03/MF A1 CSCL 21C

A slightly modified 8-cm Hg ion thruster demonstrated significant increase in performance. Thrust was increased by almost a factor of five over that of the baseline thruster. Thruster operation with various three grid ion optics configurations; thruster performance as a function of accelerator grid open area, cathode baffle, and cathode orifice size; and a life test of 614 hours at a beam current of 250 mA (17.5 mN thrust) are discussed. Highest thruster efficiency was obtained with the smallest open area accelerator grid. The benefits in efficiency from the low neutral loss grids were mitigated, however, by the limitation such grids place on attainable ion beam current densities. The thruster components suffered negligible weight losses during a life test, which indicated that operation of the 8-cm thruster at extended levels of thrust and power is possible with no significant loss of lifetime. Author

N83-14158*# Hughes Research Labs., Malibu, Calif.

ANALYSIS AND DESIGN OF ION THRUSTER FOR LARGE SPACE SYSTEMS Final Report, 21 May 1979 - 21 May 1980

R. L. Poeschel and S. Kami Sep. 1980 113 p refs

(Contract NAS3-21936)

(NASA-CR-165140; NAS 1.26:165140) Avail: NTIS HC A06/MF A01 CSCL 21C

Design analyses showed that an ion thruster of approximately 50 cm in diameter will be required to produce a thrust of 0.5 N using xenon or argon as propellants, and operating the thruster at a specific impulse of 3530 sec or 6076 sec respectively. A multipole magnetic confinement discharge chamber was specified. Author

N83-14159*# Xerox Electro-Optical Systems, Pasadena, Calif.

ANALYSIS AND DESIGN OF ION THRUSTERS FOR LARGE SPACE SYSTEMS Final Report, 23 May 1979 - 23 May 1980

Edmund L. James 31 Jul. 1980 88 p refs

(Contract NAS3-21937)

(NASA-CR-165160; NAS 1.26:165160) Avail: NTIS HC A05/MF A01 CSCL 21C

This study undertakes the analysis and conceptual design of a 0.5 Newton electrostatic ion thruster suitable for use on large space system missions in the next decade. Either argon or xenon gas shall be used as propellant. A 50 cm diameter discharge chamber was selected to meet stipulated performance goals. The discharge plasma is contained at the boundary by a periodic structure of alternating permanent magnets generating a series of line cusps. Anode strips between the magnets collect Maxwellian electrons generated by a central cathode. Ion extraction utilizes either two or three grid optics at the user's choice. An extensive analysis was undertaken to investigate optics behavior in the high power environment of this large thruster. A plasma bridge neutralizer operating on inert gas provides charge neutralizing electrons to complete the design. The resulting conceptual thruster and the necessary power management and control requirements are described. Author

N83-14160# Texas Univ., Austin. Fluid Dynamics Inst.

IMPINGEMENT FLOW-FIELDS FOR TUBE-LAUNCHED ROCKETS

Stanley A. Bouslog, John J. Bertin, and William B. Wingert, II Redstone Arsenal, Ala. Army Missile Command Aug. 1982 105 p refs

(Contract DAAH01-81-C-B078)

(AD-A119386; DRSMI/RL-CR-82-5; Rept-82-101) Avail: NTIS HC A06/MF A01 CSCL 21/2

An experimental program has been conducted to measure the pressures acting on the face of a launcher assembly due to the impingement of an underexpanded rocket exhaust flow. For the range of variables considered in the present test program, the following conclusions are made. (1) The most important characteristic dimension for the impingement flow-field is the ratio of the plume diameter to the diameter of the open tube. (2) When the stagnation pressure is relatively low most of the exhaust gas is swallowed by the open tube. High surface pressures are limited to the region near the rim of the open tube. (3) Once a critical value of Pt1 is exceeded, the central shock wave increases in size and in strength. (4) The opening of one tube adjacent to the launch tube has only a slight effect on the pressure distribution present on the face of the launcher. (5) The maximum pressure differentials that act across the missile itself occur when the flow is supercritical and the nozzle-exit plane is near the face of launcher. GRA

N83-14161# Naval Weapons Center, China Lake, Calif. Ordnance Systems Dept.

DATA PROCESSING FOR THE DETERMINATION OF CHEMICAL KINETIC PARAMETERS Final Report for FY 1981

Gregory A. Vernon Aug. 1982 73 p refs

(WO592001)

(AD-A119300; NWC-TP-6337) Avail: NTIS HC A04/MF A01 CSCL 09/2

Renewed interest in thermal analysis has stimulated development of new computer-compatible techniques for data analysis and reduction. Application of these techniques is intended for use in the determination of chemical kinetic parameters of rocket motor and warhead liners, propellants, and explosives in an effort to increase the safety of handling this hardware. The numerical methods for data reduction in the field of thermal analysis have had to be updated due to new instrumentation and increasing computer technology. Chemical kinetics subroutines have been developed for isothermal and nonisothermal differential scanning calorimetry and for differential thermal analysis by digitizing analog outputs. Mathematic interpretation of thermodynamic data is accomplished with application of the Gibbs-Helmholtz equation.

Author (GRA)

N83-14162# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

METHOD OF CALCULATING ROCKET ENGINE NOZZLE CONTOUR FOR OPTIMUM THRUST

Tian Minhua 3 Aug. 1982 8 p refs Transl. into ENGLISH from

Gongcheng Rewuli Zuebao (China), v. 2, no. 3, Aug. 1981 p 259-261
(AD-A118931; FTD-ID(RS)T-0057-82) Avail: NTIS HC A02/MF A01 CSCL 21/8

Combining the characteristic method with variation principle and applying it to supersonic flow field, a calculating method is presented for the optimum-thrust-nozzle contour design. This method can be used to design nozzle contours with various throat curvature radii and expansion area ratios. It is especially suitable for the design of nozzle contour with large expansion area ratio.
Author

N83-14163# Aerospace Corp., El Segundo, Calif. Lab Operations.
STUDIES OF PLASMA PROPERTIES IN ROCKET PLUMES Interim Report, 1 Apr. 1981 - 31 Mar. 1982
Richard H. C. Lee, I-Shih Chang, and Gordon E. Stewart 17 May 1982 63 p refs
(Contract F04701-81-C-0082)
(AD-A119614; TR-0082(2619)-1; SD-TR-82-44) Avail: NTIS HC A04/MF A01 CSCL 21/2

Various factors which affect the gas density and electron density distribution in the exhaust plume from solid rocket engines were studied. The particulates affect the plume density distribution through their effects on the nozzle flow field. The two-body attachment reaction Hcl + e = H + cl- is the dominant reaction in determining the ionization level in the nozzle expansion. The chemical and physical phenomena required to accurately determine the plume plasma properties for subsequent radio frequency interaction analysis are identified. Author (GRA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N83-14164# Stanford Univ., Calif. Center for Materials Research.
MATERIALS RESEARCH AT STANFORD UNIVERSITY Annual Report, 1 Jul. 1981 - 30 Jun. 1982
Jul. 1982 491 p refs
(Grant NSF DMR-80-20248)
(AD-A118995; CMR-82-24; AR-21) Avail: NTIS HC A21/MF A01 CSCL 05/1

Total reseach activity related to materials science at Stanford University is discussed. Nondestructive testing, polymers, novel catalytic materials, and fibers are among the topics discussed.
R.J.F.

N83-14165# Naval Research Lab., Washington, D. C.
PYROLYSIS OF ORGANIC COMPOUNDS CONTAINING LONG UNBRANCHED ALKYL GROUPS Final Report
George W. Mushrush and Robert N. Hazlett 21 Sep. 1982 30 p refs
(WR0240201)
(AD-A119749; NRL-8630) Avail: NTIS HC A03/MF A01 CSCL 07/4

The presence of n-alkanes in jet fuel in the right distillation range can be explained if large n-alkanes are present in the crude-oil source. Quantities of large n-alkanes present in crudes made from shale are insufficient, however, to explain the amounts found (up to 37%) in the jet fuel made from these crudes. Although possible precursors to small straight chain molecules are branch alicyclic compounds or substituted cyclic compounds, this report shows that attack in the side chain of model aromatic compounds typically found in shale crudes affords a path to significant yields of n-alkanes. Primary attack at the alpha and gamma positions is favored for substituted benzenes and pyridines. The major initial product distribution can be explained on the basis of Fabuss-Smith-Satterfield theory. Author (GRA)

N83-14166# Gulf Research and Development Co., Pittsburgh, Pa.
LOW COST AROMATIC ACETYLENE AND OLIGOMERIC BENZILS AND THEIR CONVERSION TO ACETYLENE TERMINATED QUINOXALINES Final Report, 10 Apr. 1981 - 31 Mar. 1982
E. T. Sabourin Wright-Patterson AFB, Ohio AFWAL Jul. 1982 47 p refs
(Contract F33615-81-C-5016; AF Proj. 2303)
(AD-A119808; AFWAL-TR-82-4068) Avail: NTIS HC A03/MF A01 CSCL 07/3

A novel oligomeric acetylene terminated quinoxaline composition was prepared in a five step reaction sequence staring from m-dibromobenzene and acetylene. The new material showed a Tg of about 65 degrees. Removal of catalytic amounts of palladium and copper used in the preparation was found to be very difficult. A 50 gram sample of the new resin was prepared and submitted to AFWAL/MLBP for evaluation. Research efforts to catalytically replace chlorine atoms in chloroaromatics by acetylene groups were unsuccessful. A study was made of the effect of temperature and pressure on the preparation of 4,4-bis(3-bromopenoxyl) phenylsulfone. GRA (Author)

24 COMPOSITE MATERIALS

Includes laminates.

N83-14167 Stanford Univ., Calif.
SUPERPLASTICITY IN FERROUS LAMINATED COMPOSITES Ph.D. Thesis
Barry Craig Snyder 1982 298 p
Avail: Univ. Microfilms Order No. DA8220544

The elevated temperature mechanical behavior of ferrous laminated composites was investigated. These composites consisted of alternating layers of superplastic 52140 (an ultrahigh carbon steel) and non-superplastic interstitial-free iron and were prepared by roll bonding below the A sub 1 temperature. The composite behavior was analyzed on the basis that its flow stress is given by the sum of the flow stresses of each component, compensated for volume fraction, under isostrain conditions. Constitutive equations were developed for the components and were used in the isostrain predictions. Dissert. Abstr.

N83-14168*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ADVANCED MANUFACTURING DEVELOPMENT OF A COMPOSITE EMPENNAGE COMPONENT FOR L-1011 AIRCRAFT. PHASE 4: FULL SCALE GROUND TEST Final Report
A. Jackson and F. Dorwald Dec. 1982 73 p refs
(Contract NAS1-14000)
(NASA-CR-166015; NAS 1.26:166015; LR-30357) Avail: NTIS HC A04/MF A01 CSCL 11D

The ground tests conducted on the advanced composite vertical fin (ACVF) program are described. The design and fabrication of the test fixture and the transition structure, static test of Ground Test Article (GTA) No. 1, rework of GTA No. 2, and static, damage tolerance, fail-safe and residual strength tests of GTA No. 2 are described. J.D.

N83-14169*# Textron Bell Helicopter, Fort Worth, Tex.
FLIGHT SERVICE EVALUATION OF COMPOSITE COMPONENTS ON THE BELL HELICOPTER MODEL 206L: DESIGN, FABRICATION AND TESTING
Herbert Zinberg Nov. 1982 75 p refs
(Contract NAS1-15279)
(NASA-CR-166002; NAS 1.26:166002) Avail: NTIS HC A04/MF A01 CSCL 11D

The design, fabrication, and testing phases of a program to obtain long term flight service experience on representative helicopter airframe structural components operating in typical commercial environments are described. The aircraft chosen is the Bell Helicopter Model 206L. The structural components are

the forward fairing, litter door, baggage door, and vertical fin. The advanced composite components were designed to replace the production parts in the field and were certified by the FAA to be operable through the full flight envelope of the 206L. A description of the fabrication process that was used for each of the components is given. Static failing load tests on all components were done. In addition fatigue tests were run on four specimens that simulated the attachment of the vertical fin to the helicopter's tail boom.
R.J.F.

N83-14170*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF SIMULATED LIGHTNING ON COMPOSITE AND METALLIC JOINTS
William E. Howell and J. Anderson Plumer (Lightning Technologies, Inc., Pittsfield, Mass.) Oct. 1982 29 p refs Presented at the Army Symp. on Solid Mech., Cape Cod, Mass., 21-23 Sep. 1982
(NASA-TM-84554; NAS 1.15:84554) Avail: NTIS HC A03/MF A01 CSCL 11D

The effects of simulated lightning strikes and currents on aircraft bonded joints and access/inspection panels were investigated. Both metallic and composite specimens were tested. Tests on metal fuel feed through elbows in graphite/epoxy structures were evaluated. Sparking threshold and residual strength of single lap bonded joints and sparking threshold of access/inspection panels and metal fuel feed through elbows are reported. E.A.K.

N83-14171# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
OPTIMIZATION OF HIGH-STRENGTH CONCRETE MIXTURE PROPORTIONS FOR THE ANMCC IMPROVEMENT PROJECT Final Report
Anthony A. Bombich and A. Dale Magoun (Applied Research and Analysis, Inc.) Aug. 1982 117 p refs
(AD-A118966; WES/MP/SL-82-12; CTIAC-58) Avail: NTIS HC A06/MF A01 CSCL 11/2

High-strength concrete mixtures were proportioned and tested in order to achieve compressive strengths in excess of 9,000 psi at 1 year of age and 11,000 psi at 2 years of age. These mixtures were proportioned to minimize total heat generation when used during construction of the Alternate National Military Command Center (ANMCC). Minimization of heat generation, especially that occurring at early ages, serves to minimize thermal strains occurring in the concrete cavity liners. The study was conducted in two phases. In Phase I a matrix of 28 high-strength concrete mixtures was evaluated to isolate concrete mixtures which best met the specified criteria. Mixtures contained several levels of water reduction, cement contents, and pozzolan (fly ash) replacement of cement. Steel fibers were also used. Curing was done at 733 F and 122 F in sealed and immersed condition. Phase II included tests on the mixture chosen as optimum from Phase I. Included were tests to determine thermal and mechanical properties on concrete specimens cured at 73 F and 122 F in sealed condition. The data obtained from Phase II tests were used in computer thermal studies for the ANMCC. GRA

N83-14172# New Mexico Univ., Albuquerque. Engineering Research Inst.
PORTLAND CEMENT CONCRETE RECYCLING: TECHNOLOGY REVIEW Final Report, Aug. 1981 - Jan. 1982
R. Gordon McKeen and David E. Newcomb Tyndall AFB, Fla. AFESC Jan. 1982 70 p refs
(Contract F29601-81-C-0013; AF Proj. 2104)
(AD-A118930; NMERI-5.07-IA5-6; AFESC/ESL-TR-82-11) Avail: NTIS HC A04/MF A01 CSCL 11/2

The review of current technology pertaining to the recycling of existing portland cement concrete pavements was conducted. The purpose was to assess the applicability of recycling to U.S. Air Force pavement rehabilitation work. Costs of alternatives were reduced to simple models for use in evaluating sensitivity to cost factors. A study of projects on which this technology was used identified aggregate cost and haul distance as key factors. GRA

N83-14173# Aeronautical Research Labs., Melbourne (Australia). Materials Div.
PROCEDURE FOR APPLICATION OF BORON-FIBRE REINFORCED PLASTIC PATCH TO THE MIRAGE LOWER WING SKIN FUEL DECANT REGION
M. J. Davis and J. D. Roberts Aug. 1981 38 p
(AD-A119545; ARL/MAT-TM-373; AR-001-803) Avail: NTIS HC A03/MF A01 CSCL 01/3

Aeronautical Research Laboratories have developed a new procedure for the repair of metallic aircraft components suffering from cracking due to fatigue or stress-corrosion; the procedure is based on the use of patches made from Boron-Fiber Reinforced Plastic which are adhesively bonded over the crack region. Crack patching using this technique has been successfully used in a number of repair applications on RAAF aircraft since 1975, and has been shown to be highly cost effective and also to have many other advantages over standard repair procedures. More recently, a 'crack patching' procedure was developed by ARL to repair fatigue cracks which have developed in the lower wing skins of some RAAF Mirage aircraft. Since this was a much more critical and complex application than any previously undertaken, involving the use of specially developed ground support equipment, a detailed specification was written as a guide for RAAF personnel, who were trained to implement the repair; this specification is presented in this Memorandum. Author (GRA)

N83-14174# Naval Surface Weapons Center, White Oak, Md.
THE ULTRASONIC DETECTION OF UNBOND IN DEEP LAYERS OF MULTILAYERED COMPOSITES Final Report, 15 Jul. 1981 - 31 Mar. 1982
Robert A. Youshaw and Jeffrey M. Warren 10 May 1982 30 p
(AD-A119402; AD-F500071; NSWC/TR-82-236) Avail: NTIS HC A03/MF A01 CSCL 11/4

The through transmission ultrasonic method was applied to the problem of detecting unbond in deep layers of multilayer composites. A casting containing severe internal defects was used for the base metal. A range of thickness and non-parallel surfaces were considered. Using the decibel scale, the casting was characterized on a one inch grid. From the difference between this and subsequent measurements as layers were applied, it was possible to distinguish between bond and unbond on layers well beneath the surface. GRA

N83-14175# European Space Agency, Paris (France). Mechanical Systems Div.
GUIDELINES FOR CARBON AND OTHER ADVANCED FIBER PREPREG PROCUREMENT SPECIFICATIONS
Aug. 1982 35 p Prepared in cooperation with ESTEC, Noordwijk, Netherlands
(ESA-PSS-58-Issue-1; ISSN-0379-4059) Avail: NTIS HC A03/MF A01

Information to assist in the preparation of specifications for the procurement of advanced composite prepregs is given. The guideline is biased towards the special requirements of carbon fiber reinforced plastics for use in spacecraft structures. The subjects discussed include definitions, classification of prepregs, requirements for qualification and batch testing, laminate requirements, test methods and specifications structure. Author (ESA)

N83-14515# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
RESEARCH ON DYNAMICS OF COMPOSITE AND SANDWICH PLATES, 1979 - 1981
C. W. Bert *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 10 Oct. 1982 p 17-34 refs Document also announced as N82-33441 (For primary document see N83-14512 05-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N83-14176*# Yale Univ., New Haven, Conn.
CONTAINERLESS HIGH TEMPERATURE PROPERTY MEASUREMENTS BY ATOMIC FLUORESCENCE Annual Technical Report
Paul C. Nordine and Robert A. Schiffman Oct. 1982 33 p refs
(Contract NAS8-34383)
(NASA-CR-170683; NAS 1.26:170683; YU8-34383-FRI) Avail: NTIS HC A03/MF A01 CSCL 07D

Laser induced fluorescence techniques were developed for the containerless study of high temperature processes, material properties, levitation, and heating techniques for containerless earth-based experimentation. Experiments were performed in which fluorescence of atomic aluminum, mercury, or tungsten were studied. These experiments include measurements of: (1) Al atom evaporation from CW CO2 laser heated and aerodynamically levitated sapphire and alumina spheres, and self-supported sapphire filaments, (2) Al atom reaction with ambient oxygen in the wake of a levitated specimen, (3) Hg atom concentrations in the wake of levitated alumina and sapphire spheres, relative to the ambient Hg atom concentration, (4) Hg atom concentrations in supersonic levitation jets, and (5) metastable, electronically excited W atom concentrations produced by evaporation of an electrically heated tungsten filament. S.L.

N83-14177*# Florida Univ., Gainesville. Ceramics Div.
MECHANISMS OF DEVITRIFICATION OF GRAIN BOUNDARY GLASSY PHASES IN Si3N4 MATERIALS Summary Technical Report
L. L. Hench 17 Dec. 1982 129 p refs
(Grant NsG-3254)
(NASA-CR-169670; NAS 1.26:169670) Avail: NTIS HC A07/MF A01 CSCL 07D

Changes in the grain boundary (g.b.) phases of Si3N4 are analyzed, the effects of composition and thermal history on devitrification of the g.b. phases are determined, devitrification of the g.b. phases of Si3N are related to mechanical behavior and oxidation sensitivity of the material. The phase relationships that occur within the grain boundaries of Si3N4 containing various densification aids are reviewed. Comparisons of the effects of MgO, Y2O3, CeO2, and Y2O3 + AL2O3 are made in terms of the phase equilibria of the Si3N4 + SiO2 + additive compositional system. Two new equilibrium phase diagrams for the Si3N4-SiO2 and Y2O3 and Si3N4-SiO2-Ce2O3 systems are preented. The effects of Y2O3 vs CeO2 densification aids on the fracture surfaces of Si3N4 are compared. Auger electron spectroscopy shows that both oxides are concentrated within the fracture surface. Scanning electron microscopy shows evidence that Si3N4 with CeO2 formed an intergranular structure of fine grained oxynitride reaction products, as predicted by phase quilibria, whereas the Y2O3 containing sample shows evidence of an intergranular glassy phase. S.L.

N83-14178# Centec Consultants, Inc., Reston, Va. Office of Industrial Programs.
PROGRAM GUIDE TO USED OIL RECYCLING
Jan. 1982 40 p refs Supersedes DOE/CS-0015
(Contract DE-AC01-80CS-40402)
(DOE/CS-40402/1; DOE/CS-0015) Avail: NTIS HC A03/MF A01

Information necessary to organize a used oil recycling program, establish collection points, and enlist the cooperation of concerned individuals and civic minded groups is presented. Emphasis is placed on salvaging a valuable energy resource and reducing environmental pollution caused by indiscriminate dumping and uncontrolled burning. J.M.S.

N83-14179# State Univ. of New York, Buffalo. Dept. of Chemisty.
THERMODYNAMICS AND PHOTOELECTROCHEMICAL BEHAVIOR OF THE n-TI02 ELECTRODE IN FLUORIDE CONTAINING SOLUTIONS
Tadeusz Hepel, Maria Hepel, and R. A. Osteryoung 1 Sep. 1982 54 p refs
(Contract N00014-79-C-0682)
(AD-A119144; SUNYBUF/DC/TR-10) Avail: NTIS HC A04/MF A01 CSCL 07/5

Diagrams of the stable and metastable electrochemical equilibria for the system Ti - HF - H20 at 25 C have been constructed. Increased solubility of titanium dioxide in fluoride containing solutions has been found to occur over a narrow range of solution pH near 3.2. On the basis of the thermodynamic diagrams, appropriate conditions for etching n-Ti02 semiconductor electrodes were chosen. The etching solutions prepared for the n-Ti02 semiconductor electrodes showed very good surface-cleansing properties. A photoetching process under anodic bias is recommended for the preparation of the n-Ti02 surface for the purpose of use in solar energy converters. The doping profile in the space-charge layer which forms during the photoetching treatment is more effective for splitting the electron-hole pair created in a working electrochemical solar cell. Photocurrent-voltage characteristics obtained for n-Ti02 electrodes in F-solutions do not fit the Butler-Gartner equation, since the Butler-Gartner equation does not correctly describe photoeffects on medium and heavily doped semiconductor electrodes. From the chronovoltamperometric and coulometric study of the reactions taking place at electrode potentials negative of the flat-band potential, only the first step of the Ti02 reduction to lower oxides is reversible.
Author (GRA)

N83-14180# Industrial and Biomedical Sensors Corp., Waltham, Mass.
DEVELOPMENT OF A HELIUM/CARBON DIOXIDE/HYDROGEN SENSOR SYSTEM FOR SCUBA Final Report, 1 Jan. - 30 Jul. 1982
Kuo Wei Chang and Sanlu Chang 16 Aug. 1982 63 p refs
(Contract N00014-82-C-0134)
(AD-A118950) Avail: NTIS HC A04/MF A01 CSCL 06/11

The feasibility of a Helium/Carbon Dioxide/Hydrogen sensor system for SCUBA diving has been investigated. The helium sensor is a piezoelectrically excited diaphragm with its acoustic characteristics related to the helium concentration. The carbon dioxide sensor is an enzymatic/electrolyte anion exchange cell operating in a diffusion controlled mode, where the cell current is proportional to the partial pressure of CO2. The hydrogen sensor is a hydrogen/oxygen fuel cell operating in the hydrogen-diffusion-limited mode where the short circuit current is directly proportional to the hydrogen partial pressure. Laboratory versions of various sensors have been fabricated and tested. Helium sensors based on frequency shift were found to be ineffective, whereas those based on amplitude attenuation measurement were feasible but impractical due to its requirement for depth correction. A more attractive ultrasonic speed-of-sound sensor which circumvents this problem has evolved from the current development. Also, the feasibility and practicality of the CO2 and H2 sensors has been demonstrated. These sensors were found to be compact, rugged, sensitive, fast responding and linear within the range of interest. GRA

N83-14181# Atlantic Research Corp., Alexandria, Va.
FUEL-RICH SOLID PROPELLANT BORON COMBUSTION Annual Report, 1 Apr. 1981 - 31 Mar. 1982
Merrill K. King, James Komar, and Ronald S. Fry 28 May 1982 15 p
(Contract F49620-81-C-0035; AF Proj. 2308)
(AD-A119183; Rept-41-5032-1; AFOSR-82-0695TR) Avail: NTIS HC A02/MF A01 CSCL 21/9

A thorough critical assessment of the state-of-the-art of boron

fuel ignition/combustion has been carried out and areas of deficiency defined. An improved boron single particle ignition model treating the effects of water vapor on particle ignition has been developed. Boron single particle combustion models which include the effects of finite kinetics and correctly predict transition from a second-order dependence of burn time on particle size to a first-order dependence for small particle sizes have also been developed. Considerable progress has been made in developing an experimental apparatus and diagnostics for studying single boron particle ignition and combustion processes for small (less than 25 micron diameter) particles and for studying the kinetics of the critical (for ignition) liquid boric oxide-water vapor reaction. In addition, a test bed for study of the processes involved in burning of compacted boron solid fuel grains in a hot air crossflow has been designed and is under construction. Finally, a simplified model of processes occurring in a perfectly stirred reactor with a cloud of boron particles as the fuel has been developed and is being used in design of a test apparatus for study of boron dust cloud ignition and combustion. Author (GRA)

N83-14182# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemistry.
LEED-AES-THIN LAYER ELECTROCHEMICAL STUDIES OF HYDROGEN ADSORPTION ON PLATINUM SINGLE CRYSTALS
Arthur S. Homa, E. Yeager, and B. D. Cahan 1 Aug. 1982 25 p refs Presented at the Intern. Conf. on Electron. and Mol. Struct. of Electrode-Electrolyte Interfaces, Logan, Utah, 25-30 Jul. 1982
(Contract N00014-75-C-0953; NR Proj. 359-451)
(AD-A119192; TR-53) Avail: NTIS HC A02/MF A01 CSCL 07/4

The understanding of the relation of electrocatalysis to electrode surface structure requires measurements on electrode surfaces free of impurities and of well defined morphology. A system has been developed which allows preparation and characterization of such surfaces in an ultrahigh vacuum using LEED and AES, their electrochemical examination within a thin-layer cell, and subsequent re-examination of the surface morphology and purity. The electro-chemical adsorption-desorption of hydrogen has been studied on the three low index planes of Pt in dilute HF. When the potential range is restricted to 0.05-0.5 V vs RHE (1 atm), post-electro-chemical LEED analysis shows that the Pt(111) and (110)-(1x2) surfaces retain their original structure while the Pt (100)-(5x20) loses its 5x20 overlayer. Author (GRA)

N83-14183# University of Southern California, Los Angeles. Dept. of Materials Science.
INVESTIGATION OF IMPURITY CONCENTRATION AND ELECTRICAL PROPERTIES NEAR INTERFACES Interim Scientific Report, 1 Feb. 1981 - 31 Jun. 1982
D. B. Wittry 8 Apr. 1982 37 p refs
(Grant AF-AFOSR-0094-81; AF Proj. 2306)
(AD-A119189; AFOSR-82-0698TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

The problem of thermal conversation in semi-insulating gallium arsenide was examined using cathodoluminescence, photoluminescence and secondary ion mass spectrometry. The results indicated that a key role is played by the formation of Si(as)-V(ga) complexes. Author (GRA)

N83-14184# Exxon Research and Engineering Co., Linden, N.J. Corporate Research-Technology Feasibility Center.
RADIATION/CATALYTIC AUGMENTED COMBUSTION Annual Report, 1 Apr. 1981 - 31 Mar. 1982
Moshe Lavid May 1982 55 p refs
(Contract F49620-81-C-0028; AF Proj. 2308)
(AD-A119208; EXXON/CRUS.1BF.82; AFOSR-82-0693TR; AR-1) Avail: NTIS HC A04/MF A01 CSCL 21/5

Two novel concepts for extending aircraft operational range have been researched under this contract. They are radiative and catalytic augmentation techniques. The objective is to investigate the feasibility of the techniques to enhance combustion initiation and reaction kinetics which restrict combustion operation via limits on flammability, flame propagation, ignition and stability. Both techniques have demonstrated the potential to enhance combustion processes and to broaden normally encountered stability limits. The radiative technique under static conditions has successfully ignited fuel-air mixtures, and has enhanced combustion processes, utilizing pulsed and continuous VUV light sources. Similarly, the catalytic technique has provided efficient combustion under normally difficult fuel lean, low temperature, conditions. A complementary effort has focused on the development of analytical capabilities required for modeling the radiative and catalytic techniques. Author (GRA)

N83-14185# Naval Research Lab., Washington, D. C.
A ONE-DIMENSIONAL TIME-DEPENDENT MODEL FOR FLAME INITIATION, PROPAGATION AND QUENCHING
K. Kailasanath, E. S. Oran, and J. P. Boris 30 Sep. 1982 58 p refs
(AD-A119748; NRL-MR-4910) Avail: NTIS HC A04/MF A01 CSCL 21/2

This report describes a one-dimensional, time-dependent, Lagrangian numerical model developed to study the initiation, propagation and quenching of laminar flames. A number of new approaches and algorithms as well as input parameters used in the model are discussed. Calculations of initiation and minimum ignition energies in hydrogen-oxygen-nitrogen mixtures are presented along with calculations of the burning velocity of hydrogen in air. Author (GRA)

N83-14186# Cornell Univ., Ithaca, N. Y. Dept. of Chemistry.
SOLID STATE STANDARD ADDITION METHOD IN SECONDARY ION MASS SPECTROMETRY FOR IMPROVEMENT OF DETECTION LIMITS
Paul K. Chu and George H. Morrison 22 Sep. 1982 18 p refs
(Contract N00014-80-C-0538)
(AD-A119751; TR-8) Avail: NTIS HC A02/MF A01 CSCL 07/4

The technique of solid state standard addition is inadequate for the determination of low dopant concentrations present in real semiconductor samples. An extension of the solid state standard addition method using computer controlled signal integration is shown to lower the detection limit of boron in silicon by an order of magnitude. The precision and accuracy of this method were found to be 25% and 12%, respectively. Author (GRA)

N83-14187# Ohio State Univ., Columbus. Dept. of Chemistry.
STUDIES ON THE SYNTHESES OF BORON HYDRIDE SYSTEMS Final Report, 1 Jul. 1981 - 31 May 1982
Sheldon G. Shore 30 Jul. 1982 10 p refs
(Contract DAAG29-81-C-0029)
(AD-A119721; ARO-15611.11-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

Syntheses of the new anion (BH3C1), B2H6, B10H14, and 2-BrB4H9 are discussed. The use of B5H9 as a starting point in the preparation of B9H13L, B10H12L2 and nido-5,6-RR'C2B8H10 is described. Author (GRA)

N83-14188# Pennsylvania Univ., Philadelphia.
MECHANSIM OF INSERTION IN HIGHLY CONDUCTING GRAPHITE INTERCALATION COMPOUNDS Final Report, 1 Sep. 1978 - 1 Nov. 1981
F. Lincoln Vogel, William C. Forsman, Kam Leong, and Theodore Dziemianowicz 1 Nov. 1981 4 p refs
(Contracts DAAG29-78-C-0037; DAAG29-75-C-0022)
(AD-A119722; ARO-13169.4-MS; ARO-15804.5-MS) Avail: NTIS HC A02/MF A01 CSCL 07/2

Synthesis and properties of graphite intercalation compounds with HNO3, SbF5 and FeCl3 have been studied with an eye toward insertion mechanism and novel highly conducting compounds. Virtually all acceptor type compounds are formed by oxidation reactions initiated at the basal planes. Adducts of NOC1-FeC13 have been shown to be new oxidative intercalants. Electrical properties of graphite nitrate are relatively insensitive to the neutral HNO3 content. Author (GRA)

N83-14189# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
INSTALLATION OF A DIESEL ENGINE COMBUSTION/IGNITION EVALUATION FACILITY Interim Report, Oct. 1980 - Sep. 1981
D. M. Yost, T. W. Ryan, III, and E. C. Owens Dec. 1981 72 p refs
(Contracts DAAK70-80-C-0001; DAAK70-82-C-0001; DA Proj. 1L7-62733-AH-20)
(AD-A119610; AFLRL-152; SWRI-6800-123) Avail: NTIS HC A04/MF A01 CSCL 21/7

A facility for examining shale fuel property-related combustion/ ignition effects on diesel engine performance has been installed at the U.S. Army Fuels and Lubricants Research Laboratory (AFLRL). The facility consists of a single-cylinder conversion of a three-cylinder, two-stroke cycle engine, an engine instrumentation package for determining combustion efficiencies, and a dedicated system for rapid data acquisition. The computer system and software has been developed with the flexibility to expand into other areas of fuels and combustion research. The facility will be an effective tool in the continuing development of Army mobility fuels. Author (GRA)

N83-14190# SRI International Corp., Menlo Park, Calif.
INVESTIGATION OF MECHANISMS IN FIELD-DESORBED ION FORMATION USING A PULSED FIELD DESORPTION TIME-OF-FLIGHT MASS SPECTROMETER Final Technical Report, 15 Aug. 1978 - 19 Nov. 1981
S. E. Buttrill, Jr. Aug. 1982 44 p refs
(Contract DAAG29-78-C-0034)
(AD-A119635; ARO-15893.2-LS) Avail: NTIS HC A03/MF A01 CSCL 07/4

A pulsed field desorption time-of-flight mass spectrometer was designed and tested. Second-order energy focusing was achieved using a two-stage electrostatic reflector. Ions were formed by applying a 80-150 ns negative pulse of 2200 volts to a counter electrode spaced 50-200 micrometers away from either silicon or carbon activated emitters. The interaction of the high voltage pulse with the ion packet caused a large spread in the ion energy and limited mass resolution to only 400 at m/z 152. In separate experiments using a pulsed laser to produce ions, a time resolution of 1450 was obtained at m/z 242. Author (GRA)

N83-14191# Cornell Univ., Ithaca, N. Y. Dept. of Chemistry.
SECONDARY ION MASS SPECTROMETRIC IMAGE DEPTH PROFILE ANALYSIS OF THIN LAYERS Interim Technical Report
George H. Morrison, P. K. Chu, and William C. Harris, Jr. 22 Sep. 1982 24 p refs
(Contract N00014-80-C-0538)
(AD-A119647; TR-9) Avail: NTIS HC A02/MF A01 CSCL 07/4

Image depth profiling is applied to the quantitative analysis of molecular beam epitaxially grown gallium arsenide thin layers. The technique involves the use of ion implantation through a mask and subsequent analysis by secondary ion mass spectrometry (SIMS). The proposed approach provides high accuracy results in the analysis of semiconductor thin layers. Author (GRA)

N83-14192# Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
DIESEL COMBUSTION ANALYSIS USING RAPID SAMPLING TECHNIQUES Final Report, Jul. 1978 - Jul. 1982
G. L. Borman, P. S. Myers, and C. A. Uyehara Aug. 1982 13 p refs
(Contract DAAG29-80-C-0129; Grant DAAG29-78-G-0146)
(AD-A119658; ARO-14251.3-EG; ARO-15788.3-EG) Avail: NTIS HC A02/MF A01 CSCL 21/7

The purpose of the research was to obtain a better understanding of the fundamental processes which take place in a diesel cylinder during combustion. A single cylinder, open chamber engine with a special head designed to allow in-cylinder sampling was used for the research. Using a conventional injector, two kinds of sampling projects were carried out; timed sampling of small local samples using a probe and total cylinder sampling, achieved by suddenly expanding and transferring 80% of the cylinder content to a quench chamber. A third study used an electronic fuel injection system to study the effects of injection parameters on performance, heat release, ignition delay and exhaust emissions. GRA

N83-14193# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A CONTRIBUTION TO THE FLAT FLAME OLYMPICS: PROBLEM B Final Report
Joseph M. Heimerl Aug. 1982 67 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A119401; AD-F300073; ARBRL-TR-02416) Avail: NTIS HC A04/MF A01 CSCL 21/2

This report discusses in detail the input parameters used in computing flame speeds and profiles for the stoichiometric hydrogen-air premixed, steady-state, laminar flame. The input kinetics were specified. Our solution was obtained by use of a relaxation technique. The partial differential equations were solved using a finite element method, PDECOL. A special algorithm that enabled spatial grid points to be placed in the flame front was used. Results include: (1)information requested by the workshop that deals with specific transport parameters, (2) computed flame speeds, (3) mass fraction peak values of radical species profiles, and (4) the extrema of the enthalpy profile. We also consider the likely sources of our computed HO2 'spike' and OH double peak. We also found features in the N2 and O2 mole fraction profiles that are due simply to the mass-to-mole fraction transformation. Finally, we have compared the flame speeds, radical peaks, and enthalpy extrema when two quite different transport mixing algorithms were used. GRA

N83-14194# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
CALIBRATION OF A MASS SPECTROMETER FOR ANALYSIS OF VITRAMICRO GAS SAMPLES USING A DYNAMIC METHOD OF ANALYSIS
Wendell M. Graven and Donald E. Gilmartin 16 Aug. 1982 56 p refs
(Contract F04701-81-C-0082)
(AD-A119494; TR-0082(2935-03)-3; SD-TR-82-55) Avail: NTIS HC A04/MF A01 CSCL 07/4

A special-purpose mass spectrometer was allocated to analyze very small amounts of residual gases in electronic devices, principally traveling wave tubes. Because of device-related constraints that made it necessary to transport ultramicro amounts of gas to the analyzer, a dynamic method of analysis was adopted. Using calibrated leak sources, reliable transport and reproducible analyses of ultramicro amounts of gases were demonstrated with seven gases over a four-decade range. For inert gases, the reproducible analytical range extended below 10 to the -11th power atm/cu cm. Extensive calibrations were carried out with eight gases by using both the residual gas analyzer and the ionization gauge as detection instruments. These data, as well as the results of residual gas analyses conducted with production-quality traveling wave tubes, have validated the dynamic method of analysis. Author (GRA)

N83-14195# Texas Univ., Austin. Dept. of Chemistry.
INFRARED STUDIES OF CO ADSORPTION ON REDUCED AND OXIDIZED Pt/TI02 Technical Report, 1 Jan. - 31 Dec. 1982
Katsumi Tanaka and J. M. White 17 Aug. 1982 23 p refs
(Contract N00014-75-C-0922)
(AD-A119742; TR-27) Avail: NTIS HC A02/MF A01 CSCL 07/4

Carbon monoxide adsorption experiments were studied on reduced and oxidized Pt/Ti02 with Ft-IR. On reduced samples two kinds of linear CO species were observed and assigned as adsorption on Pt close-packed (terrace) sites 1/2094 cm. In addition a bridged CO species was found at 1/1854 cm. Both linear species show increasing frequencies with coverage. Saturation CO uptake decreases with increasing substrate reduction temperature and there is a preferential decrease of linear CO CO species on

terrace sites and the concentration of bridged species lies below detection limits. On oxidized Pt/TiO2 samples, some Pt atoms are covered with oxygen atoms and the density of step sites is enhanced. Author (GRA)

N83-14196# Brookhaven National Lab., Upton, N. Y.
PRINCIPLES OF RESONANCE-AVERAGED GAMMA-RAY SPECTROSCOPY
R. E. Chrien 1981 14 p refs Presented at 4th Intern. Symp. on Neutron-Capture Gamma-Ray Spectroscopy and Related Topics, Grenoble, France, 7 Sep. 1981
(Contract DE-AC02-76CH-00016)
(DE82-002248; BNL-30177; CONF-810920-17) Avail: NTIS HC A02/MF A01

Although it is claimed that the resonance averaged capture technique can identify all states in a given spin-parity range and provide definite spin parity information for these states, no firm analytical basis was provided which delineates its capabilities and limitations. Such an analysis is necessary to establish the spin-parity assignments derived from this method on a quantitative basis; a quantitative statement of the limits of error must be provided. To do this, a historical description of the technique and its applications is presented and the principles of the method are stated. A method of statistical analysis is described and the results are applied to recent measurements carried out at the filtered beam facilities at the Brookhaven National Laboratory. DOE

N83-14197# Los Alamos Scientific Lab., N. Mex.
LASER-ISOTOPE-SEPARATION TECHNOLOGY
R. J. Jensen and Larry S. Blair 1981 8 p Presented at the Ind. US/Japan Conf. on Laser Mater. Process., Anaheim, Calif., 16-17 Nov. 1981
(Contract W-7405-eng-36)
(DE81-030114; LA-UR-81-2423-Rev; CONF-811116-1-Rev) Avail: NTIS HC A02/MF A01

The Molecular Laser Isotope Separation (MLIS) process is discussed as an operative example of the use of lasers for material processing. The MLIS process, which uses infrared and ultraviolet lasers to process uranium hexafluoride (UF6) resulting in enriched uranium fuel to be used in electrical-power-producing nuclear reactor, is reviewed. The economics of the MLIS enrichment process is compared with conventional enrichment technique, and the projected availability of MLIS enrichment capability is related to estimated demands for U.S. enrichment service. The lasers required in the Los Alamos MLIS program are discussed in detail, and their performance and operational characteristics are summarized. Finally, the timely development of low-cost, highly efficient ultraviolet and infrared lasers is shown to be the critical element controlling the ultimate deployment of MLIS uranium enrichment. DOE

N83-14198# Stanford Univ., Calif. High Temperature Gasdynamics Lab.
PULVERIZED COAL COMBUSTION Semiannual Report, 1 Apr. - 30 Sep. 1981
Mark Jost, Ian Leslie, and C. H. Kruger Oct. 1981 30 p refs
(Contract DE-AC22-80PC-30177)
(DE82-002969; DOE/PC-30177-2; HTGL-127/48) Avail: NTIS HC A03/MF A01

A flow tube reactor for the study of the reactivity of pulverized coal under controlled conditions has been developed at Stanford University. The reactor system incorporates optical diagnostics as well as probe sampling techniques to measure the reactivity of coals with differing physical and chemical properties. The aim of the research is to provide fundamental data that can be used in the design and development of coal combustion systems. Several major improvements have recently been made on the flow tube reactor. These changes result in more flexibility in controlling the fluid mechanics, more extensive data gathering capabilities for the diagnostics, and higher data rates. Both diffusionally and kinetically controlled reactivity limits have been found in our Montana Rosebud coal experiments. Surface reactivity was not always found to increase with gas temperature. DOE

N83-14199# Amsterdam Univ. (Netherlands). Dept. of Nuclear Physics.
APPLICATIONS OF A COMPTON SUPPRESSION SPECTROMETER IN NUCLEAR SPECTROSCOPY Ph.D. Thesis
Ronald Beetz 17 Jun. 1981 101 p refs In ENGLISH; DUTCH summary Sponsored in part by Fundamenteel Onderzoek der Materie and Zuiver Wetenschappelijk Onderzoek
(INIS-mf-6639) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

This thesis described some studies in nuclear physics performed with a Compton-suppression spectrometer Examples are given in three different research areas: an investigation of a decay to an odd-odd nucleus, an investigation of high-spin states excited by a nuclear reaction, and an investigation of nuclear excitation as a result of pion capture. Besides the measurements with the suppression spectrometer alpha-alpha time coincidence measurements and conversion-electron measurements were also performed. Theoretical interpretations of the experimental results are given. (Auth.) DOE

N83-14200# Bhabha Atomic Research Centre, Bombay (India).
SPECTROGRAPHIC ANALYSIS OF THORIUM AND ITS COMPOUNDS
S. V. Grampurohit, M. D. Saksena, V. N. P. Kaimal, S. K. Kapoor, and P. S. Murty 1980 8 p refs
(DE81-700632; BARC-1079) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A spectrographic method, which employs the principle of carrier-distillation technique, is described for the analysis of high purity thoria. Two carriers, AgCl and NaF were used in determining 27 trace elements in ThO2. The elements were divided into three groups, A, B and C. In group A, 15 elements, viz. Al, B, Be, Cd, Co, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Sb, Si and Sn were included since it was possible to choose sensitive lines of these elements in one spectral region, 220 to 285 nm. Group B covered 8 elements, viz. Ag, Bi, Ca, Ga, Mo, Ti, V and Zn, which could be determined in the spectral region 290 to 352.5 nm. Group C consisted 4 elements, viz. Ba, K, Li and Na which could be determined in the spectral region 440 to 820 nm. The spectra of sample and synthetic standards were photographed on Hilger's large quartz, JACO 3.4 m Ebert plane grating and Higler's large glass spectrographs respectively for determining group A, B and C elements. DOE

N83-14201# Science Research Council, Chilton (England). Neutron Div.
NEUTRON SPIN ECHO SPECTROSCOPY ON THE SPALLATION NEUTRON SOURCE
J. Penfold and W. G. Williams Feb. 1981 38 p refs
(DE81-700290; RL-81-019) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The practicability of combining the neutron spin echo and time of flight techniques on the spallation neutron source is investigated. Preliminary specifications are presented for a quasielastic instrument with an energy resolution down to approximately 10 neV and an inleastic spectrometer for measuring excitation widths approximately 1 mu eV. DOE

N83-14202# Brookhaven National Lab., Upton, N. Y.
DESIGN AND PREPARATION OF NEW, HIGHLY ACTIVE FISCHER-TROPSCH CATALYSTS
R. Sapienza, W. Slegeir, and T. OHare 1981 24 p refs Presented at 91st Natl. Meeting of the AM. Inst. of Chem. Engr., Detroit, Mich., 16 Aug. 1981
(Contract DE-AC02-76CH-00016)
(DE82-003670; BNL-30289; CONF-810814-10) Avail: NTIS HC A02/MF A01

The application of the fundamental principles of the oxide mechanism of Fischer-Tropsch synthesis which emphasizes the relation between metal-oxygen bond strengths and catalyst activity, has resulted in a new series of highly active Fischer-Tropsch catalysts. These systems may point the way to future syngas catalyst development. The unique structural features of these

catalysts have demonstrated the importance of surface structure and its relationship to catalyst composition and activity. DOE

N83-14203# SRI International Corp., Menlo Park, Calif.
IDENTIFICATION AND CLEAVAGE OF BREAKABLE SINGLE BONDS BY SELECTIVE OXIDATION, REDUCTION, AND HYDROLYSIS Quarterly Report, 1 Jun. - 30 Sep. 1981
A. S. Hirschon, J. Zevely, and F. R. Mayo 12 Nov. 1981 21 p refs
(Contract DE-AC22-78ET-11423)
(DE82-003773; SRI-7902; QR-12) Avail: NTIS HC A02/MF A01

Bituminous coal consists mostly of an aggregate condensed aromatic and aliphatic rings, connected and made insoluble (but swellable) by crosslinks containing single bonds. The objective of this project is to determine the proportions of the various kinds of connecting links and how they can best be broken - in other words, to determine the structure of bituminous coal, with emphasis on the crosslinks and breakable single bonds. The program began with an investigation of the structure of the TIPS fraction of Illinois No. 6 coal, that is, the two-thirds of the 16% extracted by pyridine that is toluene-insoluble, pyridine-soluble, mostly through changes in molecular weight during cleavage reactions in pyridine solution. The most promising of these cleavage reactions are now being applied to the 84% of coal that is insoluble in pyridine and presents the main problem in coal liquefaction, following the progress of the reactions by formation of soluble materials and swelling of the insoluble portion. DOE

N83-14204# Spectron Development Labs., Inc., Costa Mesa, Calif.
PARTICULATE PROCESSES IN PULVERIZED COAL FLAMES Quarterly Technical Progress Report, Apr. - Oct. 1981
30 Oct. 1981 56 p refs
(Contract DE-AC22-80PC-30300)
(DE82-003370; DOE/PC/30300/T4) Avail: NTIS HC A04/MF A01

The experiment plan, the design and fabrication of the 2 color pyrometer system, and the conduct and assessment of preliminary observations of ignition and devoltalization are described. The fabrication and assembly of the furnace was completed. Initial checkout and characterization runs are in progress. The interfacing of the instrumentation with the experiment is also in progress. Experimental observations of ignition and devolatilization of Pittsburgh Seam HVA bituminous coal were initiated. Observations using both front and back light pulsed laser holography and particle sizing interferometry were made. Experiments were completed using both 80 micron and 15 micron particles. Analysis of the data holograms indicate that high quality resolution has been achieved, which will allow the observation of detail not heretofore achieved. DOE

N83-14205# Battelle Columbus Labs., Ohio.
CaO INTERACTIONS IN THE STAGED COMBUSTION OF COAL Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1981
Arthur Levy and Earl L. Merryman 1981 31 p ref
(Contract DE-AC22-80PC-30301)
(DE82-003273; DOE/PC/30301/4; QTPR-4) Avail: NTIS HC A03/MF A01

The reaction of sulfur-bearing compounds with CaO to form CaS, a kinetic and chemical parameters governing CaS and CaSO4 formation in staged combustion were investigated. The reaction of pyrite with CaO in the absence of oxygen produced CaS in increasing amounts as the temperature was raised to at least 1100 C, reaching a maximum 50 percent conversion at 1100 C after several second reaction time. The rate of CaS formation decreased significantly with time at this temperature. An unidentified compound also formed at the higher temperatures and longer reaction times which appeared to contain significant amounts of calcium and iron. At short reaction times, much of the sulfur appeared to be tied up as pyrrhotites and unreacted FeS2 with some CaS and possibly CaSO4 present. The reaction of H2S and COS with CaO is rather slow in the absence of oxygen. The formation of CaS from combustion of pulverized coal in a methane flame was investigated. DOE

N83-14206# Oak Ridge National Lab., Tenn.
CHEMICALS ENHANCED OIL RECOVERY Semiannual Report, 1 Apr. - 30 Sep. 1980
A. L. Compere, J. M. Crenshaw, S. V. Greene, W. L. Griffith, J. S. Johnson, Jr., R. M. Jones, L. J. Magid, R. Triolo, and C. G. Westmoreland Nov. 1981 41 p refs
(Contract W-7405-eng-26)
(DE82-003475; DOE-BETC-OR-18) Avail: NTIS HC A03/MF A01

Progress reports are presented for the following research areas: phase behavior in multicomponent systems containing tall oil ethoxylates; anionic tall oil derivatives (materials and methods, phase studies, interfacial tensions); sacrifical agents; economic considerations in materials selection; and materials and methods. A survey on the availability of materials, which could be used for micellar flooding revealed that some of the alternative chemicals could substantially decrease micellar flooding chemical costs. Production of C3 and C4 alcohols and vegetable and tall oil fatty acids appear at a high enough level so that their use to produce one million bbl of incremental oil per day would consume a substantial but not prohibitive fraction. DOE

N83-14207# Air Products and Chemicals, Inc., Allentown, Pa.
CATALYST AND REACTOR DEVELOPMENT FOR A LIQUID-PHASE FISCHER-TROPSCH PROCESS Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1981
Paul N. Dyer, Ronald Pierantozzi, Barry W. Brian, and Jeffrey V. Bauer Oct. 1981 38 p refs
(Contract DE-AC22-80PC-30021)
(DE82-003369; DOE/PC-30021/T7) Avail: NTIS HC A03/MF A01

Progress in investigations carried out in Task 2, slurry catalyst development, and in Task 3, slurry reactor design studies is reported. In Task 2, the 300 mL and 1000 mL slurry reactors ordered were constructed and instrumented. Mass transfer tests in the No. 1 300 mL slurry reactor were incorporated into the baseline catalyst test, because of the low activity that was found in two tests of a ruthenium methanation catalyst in the slurry phase. Two modified conventional catalysts were prepared and five gas phase screening tests were carried out, giving additional information on the conditions required to produce an enhanced C10(+) fraction. Eight supported cluster catalysts were synthesized, and eleven were screened in the gas phase. In Task 3, measurements of gas holdup and solids dispersion were completed for the silica/isoparaffin system. Preliminary correlations were derived for gas holdup as a function of gas velocity and slurry density; a near zero-order dependence upon slurry velocity was observed. The column solids profile was constant for the conditions studied. Bubble diameters were measured photographically in the two-phase system. DOE

N83-14208# Bituminous Coal Research, Inc., Monroeville, Pa.
PETROGRAPHIC EVALUATION OF PYRITE IN THE PRODUCTS FROM TWO-STAGE COAL-PYRITE FLOTATION Final Report, 1 Apr. 1980 - Nov. 1981
R. S. Tomich and R. S. Moses Nov. 1981 46 p refs
(Contract DE-AC22-80PC-30134)
(DE82-003593; DOE/PC-30134-1) Avail: NTIS HC A03/MF A01

The extent of pyritic sulfur reduction by the two-stage coal-pyrite flotation process can be predicted from the results of petrographic analyses conducted on the raw coal feed sample, Correlation studies show that the specific coal and pyrite characteristics that have a major influence on reduction of pyritic sulfur are: (1) coal rank; (2) the degree of pyrite liberation; (3) amount of pyrite available (pyritic sulfur, percent of total sulfur); and (4) pyrite-size distribution (especially the percentage of pyrite particles less than 32-micron size). The results of chemical analysis may be used to monitor a coal's response to the two-stage coal-pyrite flotation process; however, petrographic analysis is essential to precisely define the coal and pyrite characteristics that influence this response. DOE

N83-14209# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
QUALITATIVE ANALYSIS OF TATB FOR ELEMENTS IN THE RANGE OF ATOMIC NUMBERS 9 OR = TO Z OR = TO 30 USING X-RAY FLUORESCENCE SPECTROMETRY
Richard D. Worley Dec. 1981 14 p refs
(Contract DE-AC04-76DP-00487)
(DE82-004578; MHSMP-81-52) Avail: NTIS HC A02/MF A01

Qualitative analysis of TATB for elements in the range of fluorine to zinc can be performed quickly using fluorescence spectrometry. However, minimum sensitivities vary widely. DOE

N83-14210# Brookhaven National Lab., Upton, N. Y.
DESIGN AND PRELIMINARY RESULTS OF THE INTERMEDIATE DENSITY PRECIPITATION CHEMISTRY EXPERIMENT
Gilbert S. Raynor 1982 3 p Presented at the 3rd Joint Conf. on Appl. of Air Pollution Meteorol., San Antonio, 11-15 Jan. 1982
(Contracts DE-AC02-76CH-00016; EPA-79-DX-0533)
(DE81-030033; BNL-29992; CONF-820101-1) Avail: NTIS HC A02/MF A01

The Intermediate Density Precipitation-Chemistry Experiment was conducted as one of two concurrent components of the interlaboratory OSCAR (Oxidation and Scavening Characterization of April Rain) experiment under the MAP3S/RAINE (Multistate Atmospheric Power Production Study/Regional Acidity of Industrial Emissions) program. The Intermediate Density Experiment sampled up to four main events with fine temporal and moderate spatial resolution, while making maximum use of precipitation collection stations established earlier under the MAP3S program and by other agencies. In addition to the precipitation sampling network, aircraft measurements, ground-level atmospheric chemistry measurements and operation of a forecast center were part of the experimental plan. DOE

N83-14211# California Univ., Livermore. Lawrence Livermore Lab.
SPECTROSCOPIC ANALYSIS OF THE DENSITY AND TEMPERATURE GRADIENTS IN THE LASER-HEATED GAS JET
D. L. Matthews, R. W. Lee, J. M. Auerbach, L. N. Koppel, G. Charatis, D. Slater, R. Johnson, G. Busch, J. Tarvin, F. Mayer et al 1981 27 p refs Presented at the 23rd Ann. Meeting of the Div. of Plasma Phys. of the APS, New York, 12-16 Oct. 1981 Prepared in cooperation with KMS Fusion, Inc.
(Contract W-7405-eng-48)
(DE82-003169; UCRL-86413; CONF-811028-6) Avail: NTIS HC A03/MF A01

The X-ray spectra produced by a 1.0TW, lambda/sub L/-0.53 micrometers laser irradiated gas jet were analyzed. Plasmas produced by ionization of neon, argon and N2 + SF6 gases were included in those measurements. Plasma electron density and temperature gradients were obtained by comparison of measured spectra with those produced by computer modeling. Density gradients were also obtained using laser interferometry. The limitations of this technique for plasma diagnosis are discussed. DOE

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N83-14212# British Library Lending Div., Boston Spa (England).
STRAIN STATE IN EXTRUDING REFRACTORY METALS
I. N. Potapov, S. G. Kravchenko, E. N. Lapin, and V. A. Belevitin 14 Oct. 1982 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 7, 1981 p 51-55
(BLL-M-26673-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

By processing primary experimental information, the strain tensor components were determined for the extrusion of a round molybdenum bar with a steel liner between the container wall and the workpiece, using the theory of plastic flow and strain theory. The results obtained with the use of the two theories differ significantly. An analysis of the stresses, allowing for the momentary state of the metal and according to plastic flow theory, gives a better representation of the variation of the stress state in deformation. Author

N83-14213# British Library Lending Div., Boston Spa (England).
EFFECTS OF YTTRIUM ON THE SOLIDIFICATION OF CARBON STEEL
A. I. Tatsenko, G. E. Belai, T. I. Gerasimova, A. V. Tatarchuk, and I. A. Efimenko 2 Nov. 1982 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. (USSR), v. 9, 1981 p 134-139
(BLL-M-26761-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Inoculating with 0.04-0.11% of yttrium alters the nature of primary solidification and of the peritectic reaction in 4Gl carbon steel. The result is that the amount of primary ferrite is increased and the dendrite structure becomes finer. Yttrium is an effective inoculant with regard to improving the resistance of steel castings to cracking. When steel is inoculated with 0.08-0.11% Y or with other rare earth metal, the resistances to cracking of experimental grade 40Gl steel rolling mill rolls is raised by 30 to 40%. R.J.F.

N83-14214# British Library Lending Div., Boston Spa (England).
GLOBULARIZING ELEMENTS IN VERMICULAR GRAPHIC CAST-IRONS
V. N. Kropivnyi, A. M. Petrichenko, and L. A. Solntsev 14 Oct. 1982 2 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 7, 1981 p 157-158
(BLL-M-26696-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

It is demonstrated that it is advisable to add cerium when magnesium master alloys are used to produce vermicular graphite cast-irons. The reaction between the cerium and magnesium during inoculation stabilities the formation of vermicular graphite in cast-irons with a eutectic composition. Author

N83-14215# British Library Lending Div., Boston Spa (England).
RAISING THE QUALITY OF DESIGNS OF IRON AND STEEL WORKS
S. V. Gubert, E. M. Borisov, and L. Ya. Donskoi 7 Oct. 1982 18 p Transl. into ENGLISH from Stal (USSR), v. 8, 1981 p 5-10
(BLL-M-26698-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The part played by the main Soviet design institute for iron and steel works, Gipromez, in the recent, current and expected future development of the industry is described. Examples of successful design solutions, together with figures on the benefits obtained, and of steps taken to ensure a high quality of design work are given. Author

N83-14216# British Library Lending Div., Boston Spa (England).
INFLUENCE OF ALLOYING WITH COBALT AND NICKEL ON STABILITY OF PHASES IN Fe-Nb SYSTEM
K. V. Varli, T. I. Druzhinina, N. P. Dyakonova, S. E. Pirogova, and A. M. Rutman 2 Nov. 1982 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 9, 1981 p 116-118
(BLL-M-26760-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The analysis of the influence of alloying on the stability of Laves and the related u phases in the Fe-Co-Nb and Fe-Ni-Nb systems is described. Alloys of various compositions were studied by X-ray structural, micro-X-ray-spectral and metallographic methods of analysis. The decisive influence on the stability of the phases was found to be exerted by the factor of electron concentration. Author

N83-14217# British Library Lending Div., Boston Spa (England).
DEFORMATION OF A TUBE MADE FROM VISCO-PLASTIC MATERIAL
S. P. Yakovlev and V. N. Chudin 14 Oct. 1982 9 p refs Transl.

into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 7, 1981 p 55-58
(BLL-M-26674-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A functional relationship, based on creep theory, was established between an external load, its time of action and the degree of deformation for tube forming with heating. The functions derived were applied to the case of forming tubes of the magnesium-aluminium alloy MA2-1M at 300 C. Author

N83-14218# British Library Lending Div., Boston Spa (England).
INDIRECT EVALUATION OF THE RATE OF VACUUM-OXYGEN DECARBURIZATION OF HIGH ALLOY STEELS
A. A. Ivanov, V. I. Yavoiskii, V. P. Luzgin, V. I. Mikhalyov, and V. T. Tereshchenko 2 Nov. 1982 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 9, 1981 p 52-55
(BLL-M-26753-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

One of the main reasons for not being able to carry out the vacuum oxygen decarbonization (VOC) process under optimum conditions is the absence of quantitative information on the kinetics of carbon oxidation during the treatment. The relationship between the rate of oxidation of carbon and the partial pressure of oxygen in the waste gases during vacuum oxygen refining is quantitatively described. A method of indirectly estimating the rate of VOD in relation to the partial pressure of oxygen in the waste gases is suggested and tried. Author

N83-14219# British Library Lending Div., Boston Spa (England).
CHANGE IN THE DISTRIBUTION OF BORON IN A MOLYBDENUM MATRIX DURING SINTERING
E. M. Grinberg, B. I. Olshanskii, E. M. Rabinovich, and F. V. Chirkova 2 Nov. 1982 9 p refs Transl. into ENGLISH from Stal (USSR), v.9, 1981 p 79-82
(BLL-M-26742-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Alloying molybdenum powder with boron improves the properties of sintered products. The behaviour of boron during sintering is discussed in some detail, and the best means of using it are given. Author

N83-14220# British Library Lending Div., Boston Spa (England).
INVESTIGATION OF CHANGES IN THE SUBSTRUCTURE DURING ABRASION OF WHITE IRONS WITH AN AUSTENITIC MATRIX
G. M. Vorobev 14 Oct. 1982 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 8, 1981 p 83-86
(BLL-M-26720-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Abrasion tests were conducted in a special test rig with a block and roller on synthetic high-chromium irons alloyed with manganese and molybdenum. The block comprising the iron for testing was produced from induction melted iron. During abrasion, the austenite matrix of the irons undergoes cyclic hardening and softening and the duration of these processes effects the wear rate. The longer the hardening stage and the more rapid the softening stage, the higher is the abrasion resistance of the metal for a constant number and type of carbides. During wear, phase transformations occur in the iron surface layer. The greater the degree of austenite decomposition to form friction martensite, the lower is the wear rate in otherwise constant conditions. The secondary (abrasion) structure of irons with an austenitic matrix consists of globular pearlite formed by self-tempering of the friction martensite together with evenly dispersed Me7C3-type carbides. Author

N83-14221# British Library Lending Div., Boston Spa (England).
OPTIMUM CALCIUM CONTENTS OF STEEL
F. E. Dolzhenkov, A. A. Kazakov, V. I. Novik, M. P. Gazhura, and B. F. Ilyachenko 14 Oct. 1982 14 p refs Transl. into ENGLISH from Stal (USSR), v. 8, 1981 p 62-65
(BLL-M-26707-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The optimum calcium content in steel for reducing the number of plastic sulphides and converting alumina inclusions into globular nonplastic calcium oxysulphides was investigated. The optimum ratio was found to be 0.6-0.7. With this mass fraction ratio of calcium to sulphur, the impact strength of transverse specimens of hot rolled steel reaches a maximum and the impact strength anisotropy coefficient decreases to zero. With less than the optimum calcium to sulphur ratio, plastic faceted manganese sulphides and nonplastic globular calcium oxysulphides are formed. Addition of more than the optimum calcium content increases the percentage of brittle component in the sub-zero (-40 C) fracture and simultaneously increases the energy absorption capacity of the brittle fracture facets. Author

N83-14222# British Library Lending Div., Boston Spa (England).
IMPROVEMENT OF PRELIMINARY HEAT TREATMENT OF TOOL STEELS
Yu. G. Rufanov, I. I. Chalyi, L. I. Savchenko, N. I. Dovgii, and L. V. Lyakh 14 Oct. 1982 4 p Transl. into ENGLISH from Stal (USSR), v. 8, 1981 p 67-68
(BLL-M-26709-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A study was made of the influence of preliminary heat treatment on the structure, hardness, and impact strength of tool steels. Laboratory and industrial investigations showed that using low annealing of semiproduct at a temperature lower than the Ac sub 1 point instead of the normal annealing treatment improves the properties of the tool steel and the service life of blades poduced from it. Author

N83-14223# British Library Lending Div., Boston Spa (England).
METALLIZATION OF CRYSTALS OF INERT GASES
L. Z. Kimlat 2 Nov. 1982 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 9, 1981 p 171a
(BLL-M-26773-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Calculations show that temperature and pressure have different effects on the electron spectra of inert gas crystals. The pressure at which the transition to metal takes place, as determined from the bridging of the G15-X1 gap, decreases with increase in temperature and is approximately 70% of the zero-temperature pressure close to melting point. Author

N83-14224# British Library Lending Div., Boston Spa (England).
EFFECTS OF TEMPERATURE ON THE KINETIC PARAMETERS OF THE OXIDATION OF CARBON IN MOLTEN Fe-C-BASE ALLOYS
S. G. Melnik 14 Oct. 1982 4 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. (USSR), v. 7, 1981 p 152-153
(BLL-M-26690-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The results of experiments and published data have confirmed that raising the temperature only slightly increases the rate at which carbon is oxidized. The process of oxidation of carbon can therefore be limited by mass transfer of the oxidizing agent in the gas phase. Author

N83-14225# British Library Lending Div., Boston Spa (England).
GENERALIZATION OF ORDERED (REGULAR) HEATING REGIME OF SIMPLE-SHAPED BODIES WITH CONSTANT TEMPERATURE OF MEDIUM
L. A. Brovkin and E. N. Gnezdov 14 Oct. 1982 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), V. 7, 1981 p 130-134
(BLL-M-26684-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A simple expression is obtained for the temperature field of a sphere, a cylinder and a plate of variable thermophysical properties being heated by radiation and convection in a medium of constant temperature. The solution can be used under a steady (ordered,

regular) heating regime to carry out more accurate calculations on the heating of austenitic and high carbon steels, aluminum and most ceramic materials in industrial furnaces. Author

N83-14226# British Library Lending Div., Boston Spa (England).
RESEARCH INTO THE FLOW OF INTER-DENDRITE LIQUID IN THE TWO-PHASE ZONE IN METALLIC ALLOYS
N. Yu. Kolyadina, Yu. E. Matveev, and V. T. Borisov 14 Oct. 1982 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. (USSR), v. 7, 1981 p 123-126
(BLL-M-26682-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The manner in which permeability alters within the solidification temperature for In - Bi and Pb - Sn alloys has been shown. With the same two-phase zone cross-section, the alloy with the lower bismuth content has the highest permeability. Successive measurements during solidification or cooling have shown that the coefficient of permeability is lower during heating than during cooling. Author

N83-14227# British Library Lending Div., Boston Spa (England).
OPTIMAL HEATING REGIMES MINIMIZING METAL OXIDATION WITH ALLOWANCE FOR TECHNOLOGICAL CONSTRAINTS
E. A. Kapustin and L. E. Goldfarb 14 Oct. 1982 8 p refs Transl. into ENGLISH from Iz. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 7, 1981 p 126-130
(BLL-M-26683-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The problem of optimizing the temperature and heat regimes of metal heating with respect to minimum oxidation is considered. It is shown that with a combined heating regime there is an optimum heating time giving the lowest minimum amount of millscale; the amount increases an increase in heating time. Author

N83-14228# British Library Lending Div., Boston Spa (England).
THE CHILLING AND GRAPHITIZING ACTIONS OF CARBIDE-FORMING ELEMENTS IN IRON
I. A. Vashukov, I. I. Dobrovolskii, I. V. Dybenko, and A. A. Zhukov 14 Oct. 1982 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. (USSR), v. 7, 1981 p 119-123
(BLL-M-26681-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

In the metallography of iron the concepts of 'carbide-forming element' and 'chilling element' in cementite decreases, their chilling effect on the structure of iron decreases. The further an element is from iron in the Mendeleev Table to the left along a period or downwards along a subgroup, the lower its solubility in cementite and the less its chilling effect. The precipitation of special carbides in iron may even have a graphitizing effect with thermodynamic and kinetic items. L.F.M.

N83-14229# British Library Lending Div., Boston Spa (England).
DIFFUSION SATURATION COATING OF HIGH-NICKEL STEEL WITH CHROMIUM AND MANGANESE
G. V. Zemskov, R. L. Kogan, I. M. Shevchenko, A. S. Matveeva, P. I. Grankin, and E. V. Koss 14 Oct. 1982 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 7, 1981 p 110-113
(BLL-M-26680-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The simultaneous diffusion saturation coating of 44N14 high-nickel steel with chromium and manganese is discussed. Development of a suitable saturation schedule gives a coating with a high concentration of chromium in the surface layer and a high manganese content in the internal layer. The coating is twice as thick as that obtained in chromizing owing to the formation, below the carbide zone, of a layer of manganese-rich austenite. After coating, the heat and oxidation resistance are equivalent to those of chromized steel. R.J.F.

N83-14230# British Library Lending Div., Boston Spa (England).
A METHOD OF MEASURING THE VISCOSITY OF CHEMICALLY ACTIVE REFRACTORY METALS
G. A. Grigorev, V. I. Kostikov, and A. N. Borodin 14 Oct. 1982 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 7, 1981 p 8-12
(BLL-M-26670-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The method described prevents contamination of the specimen by the trucible and is based on the recording, with the use of tensometric system, of the damping of vibrations of a vertical plate, caused by the short time contact with the surface of the liquid metals and alloys in question. A formula is derived, relating the viscosity of the liquid to other parameters of the vibration damping process. The validity of the formula was verified experimentally for a number of liquids and fused metals, including titanium and zirconium. Author

N83-14231# British Library Lending Div., Boston Spa (England).
ANALYSIS OF PHASE DIAGRAMS BY METHOD OF DIRECTIONAL SOLIDIFICATION OF MELTS IN CENTRIFUGAL FIELD
D. K. Belashchenko and E. A. Lopatina 2 Nov. 1982 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 9, 1981 p 163-164
(BLL-M-26764-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A procedure proposed for investigating the solidification of metallic melts during centrifugal separation in a temperature field with a constant temperature gradient directed towards the axis of rotation was tested. Tests were carried out in a centrifugal field with acceleration of 1000 g on the systems Au-Pb (60 at .-%Pb) and Au-Sn (60 at .-%SN). Chemical analysis carried out along the length of the solidified specimens shows that the specimens consist of successive layers of different composition. The method identifies all the phases and the phase mixtures which precipitate during solidification. J.M.S.

N83-14232# British Library Lending Div., Boston Spa (England).
INFLUENCE OF GAS-PHASE COMPOSITION ON PROCESS OF CARBURIZATION OF NEWLY REDUCED IRON
Yu. S. Yusfin, V. R. Grebennikov, and V. V. Danshin 2 Nov. 1982 3 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 9, 1981 p 165-166
(BLL-M-26767-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Pellets of Lebeda supraconcentrate were subjected to oxidation firing, to reduction by H2 data temperature of 800 C, and then were carburized with H2/CO mixes at different temperatures. The dependence of carbon content (%) on temperature and composition of the gas mixture is given in tabular form. The results indicate the influence of H2 on the process of carburization. J.M.S.

N83-14233# British Library Lending Div., Boston Spa (England).
MECHANICAL PROPERTIES OF CAST STEEL WITH TREATMENT OF MELT BY PULSED ELECTRIC CURRENT
G. N. Minenko and A. P. Podyachev 14 Oct. 1982 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 7, 1981 p 156-157
(BLL-M-26695-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A brief account is given of a study of the effect of a pulsed electric current on the mechanical properties of cast steel. The influence of the degree of superheating of the steel was examined. Author

N83-14234# British Library Lending Div., Boston Spa (England).
CHANGE IN MICROSTRUCTURE AND TEXTURE DURING ANNEALING OF LIGHT-WORKED IRON OF DIFFERENT PURITY
L. Grof, I. B. Kekalo, and V. Yu. Novikov 14 Oct. 1982 2 p ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 7, 1981 p 155-156
(BLL-M-26694-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A brief account is given of an investigation of the change in

the microstructure and texture of iron of different purity during isothermal annealing after cold rolling. Coarsening of the grain was observed during short-time isothermal anneals owing to growth of crystals existing before deformation. Increase in the annealing time leads to grain refinement owing to nucleation of new recrystallized grains. R.J.F.

N83-14235# British Library Lending Div., Boston Spa (England).
DENITRATION OF IRON DURING THE HYDROGEN BOIL
Sh. Nikish, I. A. Mokrov, and V. A. Grigoryan 15 Dec. 1982 3 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. (USSR), v. 7, 1981 p 153-154
(BLL-M-26691-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The use of argon-hydrogen plasma for melting iron has been found to be effective as a means of reducing the nitrogen content of the metal. Denitration is most rapid during the hydrogen boil. Author

N83-14236# British Library Lending Div., Boston Spa (England).
BREAKDOWN OF OXIDE FILMS AT THE SURFACE OF DISPERSED IRON
V. I. Bondarchuk, D. I. Ryzhonkov, and L. A. Pronin 2 Nov. 1982 7 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), v. 9, 1981
(BLL-M-26750-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

It has been proved that, in the case of particles with diameters less than 20 micrometers, thermal stresses break down the film of oxides, none remaining on the nucleus of a particle. If the particle diameter exceeds 40 micrometers, the oxide remains on the particle nucleus, undergoing considerable changes. Author

N83-14237# British Library Lending Div., Boston Spa (England).
MATHEMATICAL MODELLING OF THE OXYGEN-ARGON RECARBURIZATION OF STEEL
A. V. Bakakin, Ya. S. Grenader, and V. A. Pevzner 2 Nov. 1982 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Chern. Met. (USSR), v. 9, 1981 p 168-169
(BLL-M-26770-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A mathematical model is constructed of the decarburization process employing blowing in a mixture of oxygen and argon. Calculations with this model and an ES-1040 computer demonstrate that blowing the melt with staged changes in the composition of the oxygen-argon mixture gives a greater amount of decarburization. J.M.S.

N83-14238# British Library Lending Div., Boston Spa (England).
THE STRUCTURE OF LIQUID METALS
S. I. Popel, M. A. Spiridonov, and Yu. I. Maslennikov 2 Nov. 1982 12 p refs Transl. into ENGLISH from Stal (USSR), v. 9, 1981 p 17-20
(BLL-M-26735-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The procedural features of diffraction techniques are discussed, including calculation of the radial distribution function from the structural factor and the use of the structural factor to calculate the properties of the liquid metal such as electrical resistance, coefficients of diffusion, viscosity and surface tension. The use of the relative stability of different regions of ordering to control crystal structure in the cast metal is discussed. R.J.F.

N83-14239# British Library Lending Div., Boston Spa (England).
A MATHEMATICAL MODEL OF THE CIRCULATORY VACUUM TREATMENT OF METAL
A. V. Bakakin, A. A. Ezhov, Yu. G. Podgorchuk, and G. F. Yakovenko 2 Nov. 1982 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 9, 1981 p 33-37
(BLL-M-26751-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A model for investigating the process of circulatory vacuum treatment over a wide range of variations of design and the technology is proposed. Author

N83-14240# British Library Lending Div., Boston Spa (England).
DESULPHURIZATION OF STAINLESS STEEL IN A GAS-OXYGEN BOTTOM BLOW CONVERTER
G. S. Kolganov and M. V. Kolesnikov 2 Nov. 1982 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 9, 1981 p 47-49
(BLL-M-26752-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A method of melting low-sulphur stainless steel in a converter bottom-blown with a gas-oxygen mixture was investigated under pilot-plant conditions. The influence of various factors on the transfer of sulphur from metal to slag was examined. A steel containing 0.006 - 0.012% sulphur was produced. Author

N83-14241 Rochester Univ., N. Y.
LOW CYCLE FATIGUE RESPONSE OF POLYCRYSTALLINE ALUMINUM Ph.D. Thesis
Jo-Chi Tsou 1982 339 p
Avail: Univ. Microfilms Order No. DA8221633

The deformation mechanisms during saturation fatigue of polycrystalline aluminum were investigated. Saturation behavior of aluminum was studied over a range of strain amplitudes, strain rates and temperatures. At temperatures higher than 200 C, both the cyclic hardening curves and the hysteresis loops exhibit a smooth drop in the stress response. The special shape of the cyclic hardening curves and the hysteresis loops is attributed to the operation of recovery mechanisms as well as grain boundary migration. Transient testing techniques were employed in exploring other aspects of saturation fatigue. Stress relaxation tests reveal that the internal stresses undergo a cyclic variation during saturation fatigue. Data from high temperature fatigue (less than 200 C) were used to obtain the activation enthalpy. Three different views on the deformation processes were employed in analyzing these data. Also included is a theoretical attempt at modeling saturation fatigue based on the concept of a stable distribution of dislocations and a mechanism of exhaustion hardening. Dissert. Abstr.

N83-14242 Rutgers - The State Univ., New Brunswick, N. J.
DEFECT STRUCTURE ANALYSIS IN CORROSION FATIGUED Al-2024-T4 AND FATIGUED Ti-6Al-4V ALLOYS Ph.D. Thesis
Toshihiko Takemoto 1982 166 p
Avail: Univ. Microfilms Order No. DA8221712

X-ray double crystal diffractometer and transmission and scanning electron microscopy methods were employed to examine the cyclic deformation response of Al-2024-T4 in aqueous corrosive medium and of Ti-6Al-4V alloys in air. Special consideration was given to the cyclic response of surface and bulk properties. Cycling Al-2024-T4 in 3.5 pct NaCl solution reduced the fatigue resistance observed in air and the application of an anodic potential promoted further degradation of the fatigue resistance. The fatigue life in high cycle corrosion fatigue was controlled by the mean cyclic stress. Hydrogen embrittlement may be the rate determining process in high cycle corrosion fatigue. In low cycle corrosion fatigue the maximum stress became the rate determining step for fatigue failure. The fatigue resistance of Ti-6Al-4V was strongly dependent on the severity of precycling. The fatigue limit lost its significance if the alloy was subjected to a precycling treatment with a high stress amplitude. The interdependence of fatigue life and fatigue limit to precycling history was attributed to microcrack formation at the specimen surface. Strain cycling induced localized planar dislocation arrays in the slip bands of the alpha phase. Dissert. Abstr.

N83-14243 Defence Research Information Centre, Orpington (England).
INFLUENCE OF THE COMPOSITION OF THE MATRIX (AND OF THE PROPORTION BETWEEN NICKEL AND COPPER) ON THE COMPACTNESS AND STRUCTURE OF HEAVY TUNGSTEN-NICKEL-COPPER TYPE ALLOYS

M. A. Drossu, P. Roman, and P. Miron Aug. 1982 14 p refs Transl. into ENGLISH from Metal. (Rumania), v. 33, no. 8, 1981 p 432-436
(DRIC-T-6716; BR84622) Copyright. Avail: Issuing Activity

Six ternary W-Ni-Cu compositions were prepared with varying ratios of nickel to copper. The ratio between tungsten and binder was constant in all samples. Two binary compositions which contained tungsten and nickel, and tungsten and copper, with the same tungsten contents as before were also prepared. These samples were examined for changes in the domain patterns. For the ternary compositions the degree of compaction decreases with increasing copper content. Author (ESA)

N83-14244# British Library Lending Div., Boston Spa (England).
ACCOUNTING-MODEL FOR TEMPERATURE DURING DISTRIBUTION OF ELECTRONS IN METALS
O. A. Evokumenko (Moscow Steel and Alloys Inst.) and L. I. Yastrebov (Moscow Steel and Alloys Inst.) [1982] 3 p refs Transl. into ENGLISH from Izv. VUZ Chernaya Met. (Moscow), no. 9, 1981 p 170
(BLL-M-26772-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

It is demonstrated that an important result of due consideration of the effect of the thermal movement of the atoms and molecules in the calculation of the electron spectra of metals is hybridization of the quantum numbers, this resulting in a marked change not only in the temperature-dependence, but also in the energy-dependence of the phase shifts with change in quantum number. Author

N83-14245*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INVESTIGATION OF WEAR PHENOMENA BY MICROSCOPY
Donald H. Buckley 16 Jul. 1982 43 p refs Presented at Microscopy of the Degradation of Materials (Wear and Erosion), MICRO 1982, Intern. Symp. and Exhibition, London, 12-16 Jul. 1982; sponsored by Royal Microscopial Society
(NASA-TM-82934; E-1239; NAS 1.15:82934) Avail: NTIS HC A03/MF A01 CSCL 11F

The various wear mechanisms involved in the loss of material from metallic and nonmetallic surfaces are discussed. The results presented indicate how various microscopy techniques used in conjunction with other analytical tools can assist in the elucidation of a wear mechanism. Without question, microscopy is the single most important tool for the study of the wear of surfaces, to assess and address inherent mechanisms of the material removal process. Author

N83-14246*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRAINRANGE PARTITIONING: A TOTAL STRAIN RANGE VERSION
Gary R. Halford and James F. Saltsman 1983 12 p refs Proposed for presentation at the Intern. Conf. on Advan. in Life Prediction, Albany, N.Y., 18-21 Apr. 1983; sponsored by ASME
(NASA-TM-83023; E-1459; NAS 1.15:83023) Avail: NTIS HC A02/MF A01 CSCL 11F

Procedures are presented for expressing the Strainrange Partitioning (SRP) method for creep fatigue life prediction in terms of total strain range. Inelastic and elastic strain-range - life relations are summed to give total strain-range - life relations. The life components due to inelastic strains are dealt with using conventional SRP procedures while the life components due to elastic strains are expressed as families of time-dependent terms for each type of SRP cycle. Cyclic constitutive material behavior plays an important role in establishing the elastic strain-range - life relations as well as the partitioning of the inelastic strains. To apply the approach, however, it is not necessary to have to determine the magnitude of the inelastic strain range. The total strain SRP approach is evaluated and verified using two nickel base superalloys, AF2-1DA and Rene 95. Excellent agreement is demonstrated between observed and predicted cyclic lifetimes with 70 to 80 percent of the predicted lives falling within factors of two of the observed lives. The total strain-range SRP approach should be of considerable practical value to designers who are faced with creep-fatigue problems for which the inelastic strains cannot be calculated with sufficient accuracy to make reliable life predictions by the conventional inelastic strain range SRP approach. Author

N83-14247*# Kentron International, Inc., Hampton, Va.
A PROPOSED CONFIGURATION FOR A STEPPED SPECIMEN TO BE USED IN THE SYSTEMATIC EVALUATION OF FACTORS INFLUENCING WARPAGE IN METALLIC ALLOYS BEING USED FOR CRYOGENIC WIND TUNNEL MODELS
D. A. Wigley (Southampton Univ.) Sep. 1982 21 p refs (Contract NAS1-16000)
(NASA-CR-166004; NAS 1.26:166004) Avail: NTIS HC A02/MF A01 CSCL 11F

A proposed configuration for a stepped specimen to be used in the system evaluation of mechanisms that can introduce warpage or dimensional changes in metallic alloys used for cryogenic wind tunnel models is described. Considerations for selecting a standard specimen are presented along with results obtained from an investigation carried out for VASCOMAX 200 maraging steel. Details of the machining and measurement techniques utilized in the investigation are presented. Initial results from the sample of VASCOMAX 200 show that the configuration and measuring techniques are capable of giving quantitative results. Author

N83-14248# Naval Ship Research and Development Center, Annapolis, Md.
PROCEEDINGS OF THE FIRST WORKSHOP ON NONDESTRUCTIVE EVALUATION (NDE) OF TITANIUM ALLOYS
O. P. Arora, ed., H. H. Chaskelis, ed. (Naval Research Lab, Washington, D.C.), and N. K. Batra, ed. (Naval Research Lab., Washington, D.C.) Jun. 1982 231 p refs Workshop held in Orlando, Fla., 9-10 Dec. 1980
(RR0220101)
(AD-A119066; DTNSRDC/SME-CR-14-82) Avail: NTIS HC A11/MF A01 CSCL 11/6

These proceedings cover briefly some of the state-of-the-art NDE techniques which may have potential applications to characterization of the Titanium Alloys and Weldments for oxygen contaminations. Most of the potentially applicable techniques covered are ultrasonics techniques, thought there is some discussion of other techniques such as acoustic emission, X-rays, photoacoustic microscopy and computed tomography. There is also some discussion of signal-processing techniques which may be useful for characterization of oxygen-contaminated Ti. Author (GRA)

N83-14249# Dayton Univ., Ohio. Research Inst.
DYNAMIC TENSILE TEST RESULTS FOR SEVERAL METALS Interim Report, Mar. - Sep. 1981
Stephan J. Bless, T. C. Challita, and A. M. Rajendran Wright-Patterson AFB, Ohio AFWAL Apr. 1982 74 p refs
(Contract F33615-81-K-5082; AF Proj. 2422)
(AD-A119054; UDR-TR-82-05; AFWAL-TR-82-4026) Avail: NTIS HC A04/MF A01 CSCL 11/6

Expanding ring and split Hopkinson bar experimental techniques were developed for study of dynamic yield behavior of metals. Preliminary results and spall data are presented for mild steel, armor steel, several aluminum alloys, OFHC copper, and nickel. Author (GRA)

N83-14250# Massachusetts Inst. of Tech., Cambridge.
DEFORMATION OF SEMI-SOLID METALS: REFINING, STRENGTHENING AND RHEOLOGICAL BEHAVIOR Final Report, 16 May 1977 - 15 Nov. 1981
Merton C. Flemings 15 Jul. 1982 15 p refs
(Contract DAAG29-77-C-0023)
(AD-A119002; ARO-14858.4-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

This report covers research activities in the broad area of deformation of solid metals and include work on metal refining, metal strengthening, and rheological behavior. A new process for

metal refining is described that combines squeezing the liquid from semi-solid metal with heating of the semi-solid mass. Another new process is described for strengthening metals by squeezing out small quantities of interdendritic material. Fundamental rheological work on the behavior of semi-solid alloys is also described. Author (GRA)

N83-14251# Pacific Corrosion Research, Inc., Huntington Beach, Calif.
A-E SERVICES TO PERFORM A CATHODIC PROTECTION SURVEY OF THE BULK FUEL TERMINALS AT N.S.C. PEARL HARBOR, HAWAII, VOLUME 2
Jun. 1982 296 p 2 Vol.
(Contract N62742-81-C-0006)
(AD-A119026) Avail: NTIS HC A13/MF A01 CSCL 13/8

Contents: This Section Includes One 25,000 BBL. Two 80,000 BBL & Two 150,000 BBL Tanks in the Pearl City Tank Farm; This Section Includes the Tanks in the Upper Tank Farm Consisting of Six 150,000 BBL Tanks, Eight Underground Diesel Storage Tanks at Building 60, Four 10,000 BBL Underground Surge Tanks, Two Ballast Tanks, Two Diesel Tanks, One Hot Settling Tank & One Diesel Flotation Tank; This Section Includes Four 50,000 BBL Tanks & One 80,000 BBL Tank at the Middle Tank Farm; This Section Includes Four 50,000 BBL Tanks at the Lower Tank Farm; This Section Includes One Outdoor Ballast Tank & One Water Storage Tank at the Stilling Basin & Associated Piping; Existing Impressed Current Type of Cathodic Protection System; Existing Sacrificial Type of Cathodic Protection System; Code of Federal Regulations, Title 49, Part 195, Status of Compliance and Recommendations for Compliance; and Three (3) POL Lines Located in the Lower Red Hill Tunnel From the Red Hill Storage Tanks to the Pearl Harbor Naval Base. GRA

N83-14252# Pacific Corrosion Research, Inc., Huntington Beach, Calif.
A-E SERVICES TO PERFORM A CATHODIC PROTECTION SURVEY OF THE BULK FUEL TERMINALS AT N.S.C. PEARL HARBOR, HAWAII, VOLUME 1 Report, Aug. 1981 - May 1982
6 Aug. 1982 420 p 2 Vol.
(Contract N62742-81-C-0006)
(AD-A119019) Avail: NTIS HC A18/MF A01 CSCL 13/8

The purpose of this corrosion survey was to inspect and checkout the existing cathodic protection systems of the underground metallic fuel lines and tanks at the Bulk Fuel Terminal, Naval Supply Center, Pearl Harbor, Hawaii. The corrosion survey was conducted from August 1981 to May of 1982. The corrosion survey was conducted on the following fuel tanks and fuel lines under Contract N62742-81-C-0006. The corrosion evaluation survey was conducted on the following fuel lines under Contract N62742-81-C-0006/P00002. GRA

N83-14253# National Bureau of Standards, Washington, D.C. Fracture and Deformation Div.
MICROMECHANICAL PROPERTIES OF BERYLLIUM AND OTHER INSTRUMENT MATERIALS Annual Technical Report, 1 Oct. 1980 - 30 Sep. 1981
Bruce W. Christ, Robert S. Polvani, Robert J. Hocken, Bruce Borchardt, and Tom Charlton Dec. 1981 49 p refs
(Contract N00014-81-F-0010; NR Proj. 039-146)
(AD-A119187; NBSIR-82-2542) Avail: NTIS HC A03/MF A01 CSCL 20/11

A program has been underway at the National Bureau of Standards since October 1977 to measure and understand the microcreep of materials used in gyroscopes so that dimensional instability can be improved. A methodology for microcreep testing has been developed and is described herein. Tensile microcreep test results between room temperature and 62 C on I-400 beryllium indicate that the microcreep strain does not exceed 1/100,000 in three months for applied stresses up to 20,000 psi. The microcreep rate of I-400 beryllium does not appear to be strongly temperature dependent in the range, 45 to 90 C. The phenomenon of microcreep exhaustion has been demonstrated experimentally and interpreted in terms of dislocation deformation processes. It is suggested that suitable micromechanical processing to promote microcreep exhaustion might serve as a method to improve dimensional stability of I-400 beryllium. The possible existence of a correlation between the microcreep stress required to produce a given strain rate and the 0.2% offset yield stress has been explored. This report includes descriptions of efforts to develop instrumentation to measure uniaxial strain at 62 C in the range, 1/10 to the 8th power to 1/10 to the 6th power and biaxial strains at room temperature in the range, 1/1000,000 to 1/1,000,000. Author (GRA)

N83-14254# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.
ELEVATED TEMPERATURE LOW CYCLE FATIGUE OF NICKEL BASE SUPERALLOYS IN THE CONVENTIONALLY CAST, DIRECTIONALLY SOLIDIFIED AND SINGLE CRYSTAL FORMS Interim Report, 1 Jun. - 31 Dec. 1981
Stephen D. Antolovich Mar. 1982 33 p refs
(Grant AF-AFOSR-0065-80; AF Proj. 2306)
(AD-A119185; AFOSR-82-0679TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

High temperature low cycle fatigue (LCF) has been studied for directionally solidified (DS) and conventionally cast (CC) Rene 80. It was found that the LCF behavior of the DS material is in reason-able accord with an approach developed previously by the author in which the life is determined by a trade-off between environmental degradation and beneficial structural coarsening. The LCF life depends on the location in the ingot (top, middle or bottom) as well as on the orientation (Longitudinal, transverse, 45 deg). The location dependence can be explained in terms of the tendency to form a script-like carbide morphology, which is most pronounced in the middle, and a modulus effect. The modulus in the middle was intermediate between the bottom (high) and top (low) and for a plastic-strain controlled LCF test led to a rather large elastic strain component. The combination of high total strain range and deleterious carbide morphology reduced the fatigue life. By similar reasoning, the life was a maximum near the bottom even though the misorientation was greatest in this region. For the CC Rene' 80 it was shown that the best data correlation was obtained by using total strain range for tests carried out at 75 F. This representation is consistent with the carbide-induced crack formation which was observed metallographically. Author (GRA)

N83-14255# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.
STRESS CORROSION CRACKING OF WROUGHT AND P/M HIGH STRENGTH ALUMINUM ALLOYS Annual Technical Report, 1 Jan. - 31 Dec. 1981
A. W. Thompson, I. M. Bernstein, and R. E. Swanson 1 Mar. 1982 27 p refs
(Grant AF-AFOSR-0041-81; AF Proj. 2306)
(AD-A119202; AFOSR-82-0680TR; ATR-1) Avail: NTIS HC A03/MF A01 CSCL 11/6

This report presents results for the first year of a three-year program. The objective of this program is to understand the stress corrosion cracking (SCC) behavior of high-strength ingot and powder metallurgy aluminum alloys, and in particular to understand the role of hydrogen in such cracking. The approach taken was to study microstructural effects on both hydrogen embrittlement and SCC, and to establish, insofar as possible, microstructural and fractographic correlations with cracking behavior, and detailed understanding of the mechanical behavior of hydrogen-charged material. Author (GRA)

N83-14256# Fairleigh Dickinson Univ., Hackensack, N.J. Physics Research Lab.
POWDER SPECTROSCOPY IN THE INFRARED SPECTRAL REGION Final Report, 1 Jun. 1979 - 31 May 1982
V. P. Tomaselli and K. D. Moeller Jul. 1982 61 p refs
(Contract DAAG29-79-C-0130)
(AD-A119703; ARO-16908.2-GS-A) Avail: NTIS HC A04/MF A01 CSCL 11/6

Experimental work is reported in the following areas: evaluation of infrared optical properties of obscurants using reflection and transmission methods; development of instrument components for a millimeter wave spectrometer; development of laser-based instrument for the measurement of optical constants of powders using internal reflection techniques; and construction of apparatus to measure the angular distribution of infrared laser radiation scattered from infinitely long conducting wires. The following projects were completed and resulted in publications: infrared optical constants of carbon powders determined from reflection measurements; far-infrared band pass filters; and far-infrared absorption of thiophene in the liquid and plastic phases.
Author (GRA)

N83-14257# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
MECHANISMS OF FRETTING FATIGUE CRACK INITIATION IN MEDIUM STRENGTH STEELS Final Technical Report
D. J. Duquette 1 Sep. 1982 7 p refs
(Contract DAAG29-79-C-0013)
(AD-A119716; ARO-15979.4-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

Effects of carburization and decarburization were studied on the fretting fatigue behavior of a medium carbon steel at room temperature. Tests were conducted in room air in a listing frame which was designed to vary the fretting (normal) load, and the relative displacement (slip amplitude) between the list specimens and fretting pads. Statistical studies conducted on the specimens indicated that after a threshold value of normal load, the fretting fatigue lives dropped by an order of magnitude. No significant effects of slip amplitude or fretting wear were observed on the fretting fatigue life.
Author (GRA)

N83-14258# Washington Univ., Seattle. Coll. of Engineering.
THE WETTING BEHAVIOR OF YTTRIA-ALUMINA-SILICA ADDITIVES FOR PRESSURELESS SINTERING OF SILICON NITRIDE Final Report, Jul. 1979 - Jan. 1981
Alan D. Miller Apr. 1982 62 p refs
(Contracts DAAG46-79-C-0054; EC-76-A-1017-002)
(AD-A119725; AMMRC-TR-82-23) Avail: NTIS HC A04/MF A01 CSCL 11/6

The aims of this study were to observe and measure the wetting behavior of liquid yttria-alumina-silica mixtures when in contact with silicon nitride at high temperature and in an environment of one atmosphere of nitrogen. Preliminary indications suggest that over a wide range of yttrium contents, the wettability range is small and that the compositions are reactive to the substrate even though they do not wet readily. A much larger experimental data base is necessary, however, over a wider range of experimental conditions to understand the wetting characteristics and reaction behavior in this complex system.
Author (GRA)

N83-14259# Cornell Univ., Ithaca, N. Y.
DIFFERENT SPUTTERING CORRECTION FOR ION MICROSCOPY USING IMAGE DEPTH PROFILING Interim Technical Rept.
Adam J. Patkin, Subhash Chandra, and George H. Morrison 22 Sep. 1982 28 p refs
(Contract N00014-80-C-0538)
(AD-A119733; TR-10) Avail: NTIS HC A03/MF A01 CSCL 20/7

A first-order correction for differential sputtering is made to ion micrographs using image depth profiling. This is done by first recording the ion image to be corrected, then sputtering down to the substrate while recording a series of images at the substrates's mass. A time-domain 'burn-through' map showing the time each location of the sample first sputters through to the substrate is then generated. This map is used to make a linear correction for differential sputtering induced ion intensity artifacts to the initial sample images. C(40)+ ion images of a radish root tip steel cell region on a tantalum substrate are corrected in this fashion. Relative sputtering rates of 1.5 and 1.2 compared to the cytoplasm were found for the cell walls and nuclei, respectively.
Author (GRA)

N83-14260# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION INTO THE TWO-WAY SHAPE MEMORY TRAINABILITY OF POLYCRYSTALLINE Cu-Zn-Al ALLOYS M.S. Thesis
Richard O. Sponholz Jun. 1982 81 p refs
(AD-A119579) Avail: NTIS HC A05/MF A01 CSCL 11/6

The ability of polycrystalline Cu-Zn-Al alloys to demonstrate increasing percentage two-way shape memory (TWSM) displacements with 'training' is investigated. Results indicate a definite relationship between increased cycling and increased TWSM ability. The empirical training cycle curve parameters are presented and shown to change with cycling. Most parameters show a decreasing trend. Transmission electron microscopy of trained alloys is conducted in an effort to mechanistically explain TWSM training.
Author (GRA)

N83-14261# McDonnell Aircraft Co., St. Louis, Mo.
ION VAPOR DEPOSITION PROCESSING OF ARMAMENT PARTS Final Report, 1 Oct. 1981 - 30 Jun. 1982
J. J. Reilly 15 Jul. 1982 31 p
(Contract DAAK10-81-R-0325)
(AD-A119810) Avail: NTIS HC A03/MF A01 CSCL 20/7

Over 3,000 armament components are currently electroplated with cadmium. All DoD organizations are committed to replace toxic cadmium wherever feasible. There is an equal need to alleviate the potential for hydrogen embrittlement failures. All electroplate processes introduce hydrogen. IVD aluminum coating per MIL-C-83488 has been identified by MIL-STD-1568 as an acceptable alternate to cadmium on steel stating its non-toxic and corrosion prevention characteristics. The object of the program is to establish IVD aluminum as a viable coating for armament hardware/parts.
Author (GRA)

N83-14262# Army Construction Engineering Research Lab., Champaign, Ill. Engineering and Materials Div.
COATINGS AND CATHODIC PROTECTION OF PILING IN SEAWATER: RESULTS OF 10-YEAR EXPOSURE AT LACOSTA ISLAND, FLORIDA Final Report
J. Bukowski and A. Kumar Aug. 1982 70 p refs
(AD-A119780; CERL-TR-M-321) Avail: NTIS HC A04/MF A01 CSCL 13/2

The objective of this study was to assess the rate of corrosion of bare steel with and without cathodic protection, and the effectiveness of various commercially available coating systems in preventing corrosion of steel piles in seawater. Included were 25 coatings and four sacrificial anode cathodic protection systems. Twenty-nine (two piles per set) American Society for Testing and Materials (ASTM) A36 or ASTM 690 steel H-piles were exposed for 10 years. Most of the piles were coated or had cathodic protection. In 1981, the piles were pulled out and inspected visually. Performance ratings were then established for the following coatings: organic, metal-filled, organic over metal-filled, metallic, organic over metallic, and organic with cathodic protection. Based on this study, the following conclusions were drawn: (1) The corrosion rates-determined by flange thickness measurements in the immersion zone-were 7 and 6 mils (0.18 and 0.15 mm) per year respectively for bare carbon (A36) and mariner (690) steel. Sacrificial zinc or aluminum anodes effectively reduced the corrosion in the immersed zone to less than 0.1 mil (0.003 mm) per year. (Adding sacrificial anodes to a coated steel piling also protects steel in the immersed zone if the coating is damaged). (2) A polyester glass flake coating (System 29) was the top performer. Epoxies over zinc-rich primers (Systems 20, 10, and 18) and vinyl-sealed, flame-sprayed aluminum and zinc (Systems 14 and 16) coatings performed very well after 10-years' exposure.
Author (GRA)

N83-14263# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.
MOLECULAR-ORBITAL BASIS FOR SUPERCONDUCTIVITY IN

HIGH- AND LOW-DIMENSIONAL METALS Interim Technical Report
K. H. Johnson and R. P. Messmer (GE, Schenectady, N.Y.) 24 Sep. 1982 102 p refs
(Contract N00014-81-K-0499; NR Proj. 056-757)
(AD-A119784; TR-4) Avail: NTIS HC A06/MF A01 CSCL 11/6

A real-space molecular-orbital description of electronic wave functions which are postulated to be the precursors of the superconducting state in highand low-dimensional metals is presented, based on self-consistent X-alpha scattered-wave (SCF-X alpha-SW) molecular-orbital calculations for clusters representing the local molecular environments in these materials. It is shown that there is a persistent correlation between the occurrence of superconductivity in a material and the existence of spatially delocalized molecular orbitals at the Fermi energy which are bonding within and antibonding between 'layers' or 'tubes' of overlapping atomic orbitals that span many atoms, forming a type of 'electron network' at the Fermi energy, as exemplified by P pi 'layered' molecular-orbital topologies in Al and (TMTSF)2PF6, and by d sigma 'tabular' molecular-orbital topologies in Nb and Nb3Sn. This description of the precursor superconducting state is consistent with the original conjectures of London that the superconducting-state wave function is 'molecular' in nature, 'rigid' in character, and of wide spatial extent, from which observed physical properties (e.g., diamagnetism and nondissipative electrical currents) of the superconducting state logically follow. GRA

N83-14264# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Centre d'Etudes Nucleaires.
FATIGUE CRACK GROWTH IN AUSTENITIC STAINLESS STEEL PIPING
M. Bethmont (Societe Franco-Americaine de Constructions Atomiques), J. L. Cheissoux, and J. Lebey Apr. 1981 9 p refs Presented at the 5th Conf. Intern. sur la Rupture, Cannes, France, 29 Mar. - 3 Apr. 1981
(DE81-700256; CEA-CONF-5698) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

First, fatigue tests of austenitic stainless steels are carried out under hot and cold conditions with straight pipes machined with notches of various dimensions. The crack propagation and the fatigue crack growth rate are measured. Second, calculations are made in order to interpret experimental results. From elastic calculations the stress intensity factor is assessed to predict the crack growth rate. The results obtained relate to longitudinal notches. GRA

N83-14265# Societe Franco-Americaine de Constructions Atomiques, Courbevoire (France).
RECENT DEVELOPMENTS IN THE ULTRASONIC TESTING OF AUSTENITIC STEEL WELDS
J. P. Launay, J. J. Olivera, and A. Thomas Dec. 1980 13 p In FRENCH Presented at the 3rd Colloq. on the Develop. of Metal Invest. Methods, Saint-Etienne, France, 3-5 Dec. 1980
(DE81-700328; FRAMATOME-CONF-25; CONF-801269-3) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The case of the longitudinal welding of the primary tube rings of the Fressenheim-1 power station has been studied. The methodology utilized includes the following aspects; metallographic study, effect of the orientation of the structure on the spreading of longitudinal ultrasonic waves, parametric study of the detection of artificial reflectors in different positions and the fabrication of special sensors. DOE

N83-14266# Bhabha Atomic Research Centre, Bombay (India). Metallurgy Div.
RESEARCH AND DEVELOPMENT WORK OF THE BHABA ATOMIC RESEARCH CENTRE Progress Report, 1978 - 1980
B. D. Sharma, ed., A. Mohan, ed., D. K. Bose, ed., C. N. Rao, ed., and S. S. Chouthai, ed. 1980 127 p refs
(DE81-700652; BARC-1083) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

Progress in research and development in the following areas is reported: extractive metallurgy, physical metallurgy, corrosion and electrometallurgy, and ceramics. The progress on a beryllium pilot plant, program for R-5 utilization for materials irradiation research, development of rare, reactive and refractory metals, and the development of ceramics materials for the MHD program is surveyed. Lists of publications, deputations, visits, conferences, colloquia are given. DOE

N83-14267# Sandia Labs., Albuquerque, N. Mex.
FRICTION AND WEAR OF STAINLESS STEELS IMPLANTED WITH Ti AND C
F. G. Yost, L. E. Pope, D. M. Follstaedt, J. A. Knapp, and S. T. Picraux 1981 8 p refs Presented at the Ann. Meeting of the Mater. Res. Soc., Boston, 16 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-004139; SAND-81-1506C) Avail: NTIS HC A02/MF A01

Friction and wear tests were completed on Fe and stainless steels of the type 304, 15-5 pH, Nitronic 60, and 440C implanted with Ti and C. Samples were mechanically polished prior to ion implantation to fluences of 2 times 10 to the 17th power Ti/cm squared (90 to 180 keV) and 2 times 10 to the 17th power C/cm squared (30 keV); the implantation profiles of the two elements overlapped to 0.1 micron. Light load wear conditions with no lubrication were evaluated in a pin on disc configuration. Ion implantation significantly reduced the friction coefficient by up to 75% and decreased the maximum wear depth by up to 95%, but both effects were material and load dependent. Only stainless steel 304 had both friction and wear reduced by implantation for all loads examined. Fine scale parallel grooves were present in the wear track for light loads, but this wear pattern was transformed to a galled structure at high loads. A correlation existed between decreased friction, reduced wear, the wear track morphology and Ti in the wear track. GRA

N83-14268# Pacific Northwest Lab., Richland, Wash.
ELECTROCHEMICAL CORROSION OF LANTHANUM CHROMITE AND YTTRIUM CHROMITE IN COAL SLAG
D. D. Marchant and J. L. Bates 1981 9 p refs Presented at the 15th Rare Earth Res. Conf., Rolla, Mo., 15 Jun. 1981
(Contract DE-AC06-76RL-01830)
(DE82-003846; PNL-SA-9195; CONF-810675-5) Avail: NTIS HC A02/MF A01

An electrochemical corrosion study of both magnesium doped lanthanium and yttrium chromites in synthetic coal slag electrolytes is described. Possible chemical and electrochemical degradation phenomena, as well as the relative rates of corrosion are emphasized. DOE

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N83-14269*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF SLIDING SPEED AND CONTACT STRESS ON TRIBOLOGICAL PROPERTIES OF ULTRA-HIGH-MOLECULAR-WEIGHT POLYETHYLENE
Robert L. Fusaro Nov. 1982 22 p refs
(NASA-TP-2059; E-1060; NAS 1.60:2059) Avail: NTIS HC A02/MF A01 CSCL 11G

A pin on disk apparatus was used to investigate the effect of sliding speed on the friction, wear, and transfer film characteristics of hemispherically tipped AISI 440C high temperature (HT) stainless steel riders sliding against ultrahigh molecular weight polyethylene (UHMWPE) disks. The surface morphology of the wear track was studied to determine possible wear mechanisms. Geometry effects were determined by comparing the results to those of others who used different specimen configurations. The results indicate that sliding speed, sliding distance, contact stress, and specimen

geometry can all markedly influence the tribological properties of UHMWPE. S.L.

N83-14270*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
USE OF HIGH PRESSURE LIQUID CHROMATOGRAPHY IN THE STUDY OF LIQUID LUBRICANT OXIDATION
Wlifredo Morales 1982 20 p refs Presented at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct. 1982; sponsored by ASME and Am. Soc. of Lubrication Engr.
(NASA-TM-83033; E-1409; NAS 1.15:83033) Avail: NTIS HC A02/MF A01 CSCL 11H

The general principles of classical liquid chromatography and high-pressure liquid chromatography (HPLC) are reviewed, and their advantages and disadvantages are compared. Several chromatographic techniques are reviewed, and the analysis of a C-ether liquid lubricant by each technique is illustrated. An analysis by size exclusion chromatography of an ester lubricant, which had been degraded using a micro-oxidation apparatus, is illustrated to show how HPLC can be used in the study of high-temperature lubricant degradation. Author

N83-14271*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUNDAMENTAL ASPECTS OF POLYIMIDE DRY FILM AND COMPOSITE LUBRICATION: A REVIEW
Robert L. Fusaro 1982 42 p refs Presented at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct. 1982; sponsored by ASME and American Society of Lubrication Engineers
(NASA-TM-82968; E-1317; NAS 1.15:82968) Avail: NTIS HC A03/MF A01 CSCL 11H

The tribological properties of polyimide dry films and composites are reviewed. Friction coefficients, wear rates, transfer film characteristics, wear surface morphology, and possible wear mechanisms of several different polyimide films, polyimide-bonded solid lubricants, polyimide solid bodies, and polyimide composites are discussed. Such parameters as temperature, type of atmosphere, load, contact stress, and specimen configuration are investigated. Data from an accelerated test device (Pin-on-Disk) are compared to similar data obtained from an end use application test device (plain spherical bearing). S.L.

N83-14272*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
METAL ION-CONTAINING EPOXIES
Diane M. Stoakley and Anne K. St.Clair Oct. 1982 13 p refs Presented at the 34th Southeastern Reg. Meeting of the Am. Chem. Soc., Birmingham, Ala., 3-5 Nov. 1982
(NASA-TM-84567; NAS 1.15:84567) Avail: NTIS HC A02/MF A01 CSCL 11G

A variety of metallic and organometallic complexes to be used as potential additives for an epoxy used by the aerospace industry as a composite matrix resin were investigated. A total of 9 complexes were screened for compatibility and for their ability to accelerate or inhibit the cure of a highly crosslinkable epoxy resin. Methods for combining the metallic complexes with the resin were investigated, gel times recorded, and cure exotherms studied by differential scanning calorimetry. Glass transition temperatures of cured metal ion containing epoxy castings were determined by thermomechanical analysis. Thermal stabilities of the castings were determined by thermogravimetric analysis. Mechanical strength and stiffness of these doped epoxies were also measured. E.A.K.

N83-14273*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A THERMOPLASTIC POLYIMIDESULFONE
Terry L. St.Clair and David A. Yamaki (Virginia Polytechnic Inst. and State Univ., Blacksburg) Nov. 1982 19 p refs
(NASA-TM-84574; NAS 1.15:84574) Avail: NTIS HC A02/MF A01 CSCL 11G

A polymer system has been prepared which has the excellent thermoplastic properties generally associated with polysulfones, and the solvent resistance and thermal stability of aromatic polyimides. This material, with improved processability over the base polyimide, can be processed in the 260-325 C range in such a manner as to yield high quality, tough unfilled moldings; strong, high-temperature-resistant adhesive bonds; and well consolidated, graphite-fiber-reinforced moldings (composities). The unfilled moldings have physical properties that are similar to aromatic polysulfones which demonstrates the potential as an engineering thermoplastic. The adhesive bonds exhibit excellent retention of initial strength levels even after thermal aging for 5000 hours at 232 C. The graphite-fiber-reinforced moldings have mechanical properties which makes this polymer attractive for the fabrication of structural composites. Author

N83-14274*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POLYIMIDES WITH PENDANT ALKYL GROUPS
Brian J. Jensen and Philip R. Young Nov. 1982 13 p refs
(NASA-TM-84575; NAS 1.15:84575) Avail: NTIS HC A02/MF A01 CSCL 11G

The effect on selected polyimide properties when pendant alkyl groups were attached to the polymer backbone was investigated. A series of polymers were prepared using benzophenone tetracarboxylic acid dianhydride (BTDA) and seven different p-alkyl-m,p'-diaminobenzophenone monomers. The alkyl groups varied in length from C(1) (methyl) to C(9) (nonyl). The polyimide prepared from BTDA and m,p'-diaminobenzophenone was included as a control. All polymers were characterized by various chromatographic, spectroscopic, thermal, and mechanical techniques. Increasing the length of the pendant alkyl group resulted in a systematic decrease in glass transition temperature (Tg) for vacuum cured films. A 70 C decrease in Tg to 193 C was observed for the nonyl polymer compared to the Tg for the control. A corresponding systematic increase in Tg indicative of crosslinking, was observed for air cured films. Thermogravimetric analysis revealed a slight sacrifice in thermal stability with increasing alkyl length. No improvement in film toughness was observed. Author

N83-14275*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHTHALOCYANINE POLYMERS Patent Application
Bappalige N. Achar (NAS-NRC, Washington, D.C.), George M. Fohlen, and John A. Parker, inventors (to NASA) Filed 10 Nov. 1982 31 p
(NASA-Case-ARC-11413-1; US-Patent-Appl-SN-440656) Avail: NTIS HC A03/MF A01 CSCL 11G

The invention relates to polymers of metal 4',4',4',4"-tetraamino phthalocyanines, wherein the metal is preferably from divalent metals such as divalent copper, cobalt or nickel, with tetracarboxylic dianhydrides and copolymers of such phthalocyanines with such dianhydrides and diamines. The dianhydrides and diamines are preferably aromatic. The direct product of polymerization is a polyamic acid having free carboxyl groups. This amic acid is heated to dehydrocyclize the polyamic acid and form the polyimide. The invention also relates to a method of preparing the tetraamino phthalocyanine by reduction of the corresponding tetranitro phthalocyanine. Thermally and oxidatively stable sheet polymers result which are useful for various purposes such as heat shielding or heat resistant films. NASA

N83-14276*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELASTOMER-MODIFIED PHOSPHORUS-CONTAINING IMIDE RESINS Patent Application
George M. Fohlen, Indra K. Varma (NAS-NRC), and John A. Parker, inventors (to NASA) Filed 15 Nov. 1982 19 p
(NASA-Case-ARC-11400-1; US-Patent-Appl-SN-441899) Avail: NTIS HC A02/MF A01 CSCL 11G

Phosphorus containing polymide resins modified with low molecular weight di(amino-group terminated) elastomers are thermally curable and are useful in producing heat, fire, solvent and chemical resistant materials such as fiber reinforced composites and laminates. NASA

N83-14277# George Washington Univ., Washington, D.C. Office of Sponsored Research.
FUNDAMENTAL APPROACH TO PROBLEMS IN CERAMIC ENGINEERING Final Report, 1 Oct. 1976 - 30 Mar. 1982
Donald M. Esterling 30 Apr. 1982 13 p
(Grant AF-AFOSR-3114-77; AF Proj. 2301)
(AD-A118886; AFOSR-82-0672TR) Avail: NTIS HC A02/MF A01 CSCL 11/2

The techniques of theoretical solid state physics and of quantum chemistry were applied to modeling defect structure and environmental effects in metals and ceramics. Author (GRA)

N83-14278# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Polymer Branch.
THE KINETICS OF POLYMER CURE BY DIFFERENTIAL SCANNING CALORIMETRY, VOLUME 1 Final Report, 1 Jul. 1976 - 30 Jun. 1981
W. W. Adams and I. J. Goldfarb May 1982 202 p refs
(AD-A118945; AFWAL-TR-81-4177-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 11/6

The need for providing processing information for new resins requires obtaining the reaction kinetics for polymerization of these resins. The kinetic parameters can be used to generate reaction window plots. Because of the exothermic nature of these reactions, differential scanning calorimetry (DSC) was utilized to obtain the kinetic parameters. Multiple-scan DSC curves at several heating rates were utilized applying the Friedman method of kinetic analysis. This method, which contains activation energies at each extent of conversion, allows kinetic parameters to be evaluated without having to assume any apriori functionality for the rate dependency. The kinetic parameters so obtained are then utilized to predict the behavior of reacting systems under a variety of isothermal conditions. This behavior is displayed in reaction window plots. The method is described, and includes descriptions of computer programs with illustrated data from the cure of new resins.
Author (GRA)

N83-14279# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
NEAT RESIN PROPERTIES OF ACETYLENE TERMINATED SULFONE FORMULATED WITH COMMERCIAL ADDITIVES Final Report, Sep. 1981 - Jan. 1982
F. L. Abrams, C. E. Browning, and J. T. Hartness Jul. 1982 19 p refs
(AF Proj. 2419)
(AD-A119372; AFWAL-TR-82-4087) Avail: NTIS HC A02/MF A01 CSCL 11/9

Acetylene terminated sulfone (ATS) was formulated with a variety of additives. These additives were selected for potential as coreactants to decrease crosslink density or as elastomeric toughening agents. The object was improvement in the tensile strain to failure of the ATS. No significant toughening was achieved by this approach. Author (GRA)

N83-14280# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
ENVIRONMENTAL CRACKING IN METALLIC GLASSES Final Report, 1 Jul. 1979 - 30 Jun. 1982
N. S. Stoloff 31 Aug. 1982 25 p refs
(Contract N00014-79-C-9583)
(AD-A119391) Avail: NTIS HC A02/MF A01 CSCL 11/2

The effects of liquid metal and hydrogen environments on fracture of amorphous alloys has been determined by means of tensile, bend, fatigue and delayed failure experiments. Fractographic features in air and in the aggressive environments are similar except for scale. Fracture occurs along shear bands in all environments. The results are in accord with an enhanced shear mechanism of embrittlement. Author (GRA)

N83-14281# Army Materials and Mechanics Research Center, Watertown, Mass. Polymer Research Div.
INTERACTIONS OF WATER WITH HYDROPHILIC POLYMER POLYURETHANES Final Report
Joyce L. Illinger Jun. 1982 132 p refs
(DA Proj. 1T1-61102-AH-42)
(AD-A118967; AMMRC-TR-82-39) Avail: NTIS HC A07/MF A01 CSCL 11/9

Two series of polyurethanes based on MDI, butanediol and several block copolymer polyethers with varying proportions of poly(ethylene-oxide) PEO and poly(propyleneoxide) PPO have been synthesized. In series 1 the ratio of PEO to PPO is varied at fixed hard segment concentration. In series 2 the hard segment concentration is varied at a feixed 50/50 ratio of PEO to PPO. All of these materials are tough film forming elastomers of approximately the same molecular weight. At constant hard block composition and decreasing amounts of PEO in series 1 polymers, water uptake decreases from approximately 60% in the polymer with pure PEO to approximately 2% for the polymer with pure PPO at 30 degrees C. These amounts of uptake increase as the temperature is decreased. The decrease in water uptake is most marked under immersion conditions or when the sorption isotherm is measured at saturation conditions. However, the trends are the same for both situations. When the hard block composition is varied a similar decrease in water uptake with increase in hard segment composition is seen although the degree of change is not so marked. The sorption isotherms are surprisingly simple concave upward curves which rise very steeply at saturation. Analysis of the data on the basis of moles of water per EO unit provides a picture of the influence of compositional variations on the course of the sorption isotherms and shows that saturation water concentrations are not related in a simple matter to PEO concentration. GRA

N83-14282# SRI international Corp., Menlo Park, Calif.
BASIC RESEARCH ON OXYNITRIDE GLASSES Final Report
Ronald E. Loehman Jul. 1982 51 p refs
(Contract DAAG29-79-C-0007)
(AD-A118925; ARO-16448.2-MS; SRI-8116) Avail: NTIS HC A04/MF A01 CSCL 11/2

Nitrogen has been partially substituted for oxygen in a wide variety of silicate systems to produce oxynitride glasses with improved properties. Nitrogen contents as high as 12 at% have been achieved. The glass-forming regions in the Y-Si-Al-O-N, Mg-Si-Al-O-N, and Ca-Si-Al-O-N systems have been investigated in detail, and those in the Si-Al-O-N, La-Si-Al-O-N, Li-Si-Al-O-N, and Sc-Si-Al-O-N systems have been studied to a lesser extent. For all compositions there is a consistent variation in properties with nitrogen content. The glass transition temperature, hardness, fracture toughness, and density all increase, and the thermal expansion coefficient decreases with increased nitrogen content. Those data, together with infrared spectroscopic results, are consistent with a structural model in which trivalent nitrogen substitutes for bivalent oxygen to give a greater degree of cross-linking in the glass network. The improved properties afforded by nitrogen substitution may lead to commercial applications for oxynitride glasses as hardened windows, high modulus glass fibers, leach-resistant coatings, and as joining compositions for nitrogen ceramics. GRA

N83-14283# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FORMATION AND STRUCTURE OF Al(PO3)3 SYSTEM GLASSES
Fu-xi Gan, Ya-si Jiang, and Fu-song Jiang 6 Aug. 1982 22 p refs Transl. into ENGLISH from Guisuanyan Xuebao (China), v. 9, no. 4, Dec. 1981 p 365-373
(AD-A119295; FTD-ID(RS)T-0750-82) Avail: NTIS HC A02/MF A01 CSCL 11/2

Glasses with Al(PO3)3 systems, in particular Al(PO3)3-AlF3-RF (RF2) systems were studied to determine the glass formation regions of Al(PO3)3-RF(RF2) and Al(PO3)3-AlF3-RF-RF2 systems, and by using the methods of differential thermal analysis, X-ray diffraction analysis, and infrared spectroscopy were used to identify the structural units of devitrification products within these glasses. The structures of these glasses are discussed. When fluorides are introduced into metaphosphate glass, this causes the long

[PO4] chains to break. The length of the chains is shortened as the fluoride content is increased, and the glass gradually changes into a pyrophosphate structure, meanwhile, with the presence of alkali fluorides, Al(3+), M(2+), and Li(+) ions can form [AlF], [MgF4], and [LiF4] structural units respectively which line up the broken chains. On the other hand, Na(+), K(+), Ca(2+), Sr(2+), and Ba(2+) all act as glass network modifying ions. GRA

N83-14284# Akron Univ., Ohio. Inst. of Polymer Science.
SPONTANEOUS ADHESION OF SILICONE RUBBER
A. N. Gent and P. Vondracek Sep. 1982 28 p refs
(Contract N00014-76-C-0408)
(AD-A119469; TR-18) Avail: NTIS HC A03/MF A01 CSCL 11/10

Lightly-crosslinked silicone rubber has been found to bond spontaneously to polar substrates and to itself. The strength of adhesion increases linearly with time, eventually reaching the fracture strength of the rubber. The process is accelerated by raising the temperature (activation energy approx 60 kJ/g-mole), by the presence of moisture, and by ammonia vapor. It is tentatively attributed to hydrolytic decomposition of the polymer leading to the formation of reactive groups which interlink with surface groups, probably hydroxyls, on polar substrates, or with each other in the case of self-adhesion. Author (GRA)

N83-14285# National Bureau of Standards, Washington, D.C.
INVESTIGATION OF THE LUBRICATION MECHANISMS OF THE COMPLEX METAL SULFIDE SbSbS4 Annual Report, 1 Oct. 1980 - 30 Sep. 1981
L. K. Ives, M. B. Peterson, J. S. Harris, P. A. Boyer, and A. W. Ruff Jul. 1982 77 p refs
(Contract N00014-80-F-0031)
(AD-A119771; NBSIR-82-2545) Avail: NTIS HC A05/MF A01 CSCL 11/6

Studies were carried out to determine certain basic properties of the complex metal sulfide, SbSbS4, that pertain to its use as a solid lubricant and lubricant additive material. Past research demonstrated that this material exhibited superior extreme pressure (EP) performance, antiwear properties, and high temperature stability. The present research verified the performance under EP conditions as an additive to a base grease. However, the performance of SbSbS4 as a solid lubricant (in the form of a powder) was not found to be effective at temperatures below about 225 C. It was noted though that, when used as a dry powder lubricant, the compound did produce a thick adherent film on steel surfaces in sliding contact. Six different types of wear and friction tests were carried out under various conditions of load, sliding speed, contact geometry, temperature, and time, in order to fully explore the potential of SbSbS4 as a lubricant on several different metals. In a number of cases, its performance was compared with MOS2 and with other sulfur containing additives in lubricants. Electron microscopy studies on film material removed from the sliding contact surfaces showed that the interaction of sulfur released from SbSbS4 with the steel surface, presumably at locally elevated temperatures, is a principal mechanism. GRA

N83-14286# Akron Univ., Ohio. Inst. of Polymer Science.
SLOW DECOMPOSITION OF SILICONE RUBBER
P. Vondracek and A. N. Gent Sep. 1982 29 p refs
(Contract N00014-76-C-0408)
(AD-A119458) Avail: NTIS HC A03/MF A01 CSCL 11/10

The sol content of previously-extracted samples of lightly-crosslinked silicone rubber has been found to increase during prolonged storage under relatively mild conditions. Simultaneously, the tensile stress slowly decreases in samples held stretched, and the equilibrium degree of swelling increases somewhat. Thus, the polymer network appears to undergo slow decomposition. This process is accelerated by moisture, by ammonia vapor and by raising the temperature of storage. GRA

N83-14287# Naval Surface Weapons Center, White Oak, Md.
POLYURETHANE FOAMS FOR AIRCRAFT SHOCK MOUNTS. 4: OTHER POLYOLS Final Report, Jul. 1980 - Sep. 1981
James V. Duffy Jun. 1982 29 p
(AD-A119399; AD-F400070; NSWC/TR-82-176) Avail: NTIS HC A03/MF A01 CSCL 01/3

A number of polyether polyurethane flexible foams are being developed as shock mitagators for electronic equipment aboard Navy aircraft. These foams are based on polyol mixtures derived from poly(oxytetramethylene) glycol and poly(oxypropylene)polyol. This report describes the effect that changes in the basic polyol composition has on the foam's vibration damping and mechanical properties. GRA

N83-14288# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
ION-CHROMATOGRAPHIC DETERMINATION OF BORON IN BOROSILICATE GLASSES
Jessie G. Smith 1981 6 p refs Presented at the 25th Conf. on Anal. Chem. and Nucl. Technol., Gatlinburg, Tenn., 6-8 Oct. 1981
(Contract DE-AC09-76SR-00001)
(DE82-001738; DP-MS-81-32; CONF-811025-14) Avail: NTIS HC A02/MF A01

An ion chromatographic method is applicable to the determination of boron below 30 ppM in a sodium and silicon rich matrix. Determination of boron in frit and product glass is essential to understanding behavior of a process being developed to immobilize nuclear waste in borosilicate glass. With this method, glass samples are dissolved in hydrofluoric acid to convert boron to the tetrafluoroborate anion. The tetrafluoroborate anion concentration is determined by ion chromatography. The instrument is contained for analysis of both nonradioactive and radioactive samples. DOE

N83-14289# Oak Ridge National Lab., Tenn.
ION-BEAM MIXING OF CERAMIC ALLOYS. PREPARATION AND MECHANICAL PROPERTIES
M. B. Lewis and C. J. McHargue 1981 7 p refs Presented at the Ann. Meeting of the Mater. Res. Soc., Boston, 16 Nov. 1981
(Contract W-7405-eng-26)
(DE82-004120; CONF-811122-15) Avail: NTIS HC A02/MF A01

Techniques used to produce unique states of pure metals mixed into ceramic materials are presented. The samples were prepared by irradiating a 1 MeV F(+) beam on Al2O3 crystal surfaces over which a thin chromium or zirconium film was evaporated. The limitations of using noble gas ion beams are noted. Micro Knoop hardness tests performed near the surfaces of the samples indicated a significant increase in the hardness of most samples prepared by ion beam mixing. GRA

N83-14290# F and G Nachrichtenkabel und -Anlagen, Arolsen (West Germany). Geschaeftsbereich Wickeldraehte.
DEVELOPMENT OF WINDING WIRES INSULATED WITH UV-HARDENING ENAMELS AND POWDER COATING RESPECTIVELY Final Report, Jun. 1981
Wolfgang Voelker Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 67 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-149; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14

Insulating systems for the manufacturing of winding wires were developed. They are composed of 65 % solvent and 35 % dissolved polymer. A graduated liquid enamel is applied on the substrate. In the succeeding heat treatments the solvent evaporates and the polymer interlaces. This procedure is repeated several times until the desired enamel insulation thickness is achieved. Two systems are described: the use of UV-interlocable liquid enamels, of which the solvents do not evaporate but become part of the insulation as a reactive solvent; and the application (e.g., electrostatic) of solventless powder coating. Results prove that UV-interlocable liquid enamels provide sufficient insulation. With powder coating it is possible to establish a usable insulation for flat and big round winding wires. Reductions in energy consumption and pollutant emission, and saving the use of solvent as a raw material, are achieved. Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N83-14291# Federal Aviation Administration, Washington, D.C.
THE IMPACT OF PETROLEUM, SYNTHETIC AND CRYOGENIC FUELS ON CIVIL AVIATION Final Report
Charles L. Blake Jun. 1982 210 p
(FAA-EM-82-29) Avail: NTIS HC A10/MF A01

Various concerns with regard to aviation fuels are discussed, including price, the effects of supply and demand, the various sources and forms of supply, alternatives, and conservation measures which reduce demand. The likelihood, the nature, and the effects of disruption in foreign crude oil deliveries to the United States are discussed. R.J.F.

N83-14292# Materials Research Labs., Melbourne (Australia).
RECENT APPROACHES TO THE SYNTHESIS OF HIGH EXPLOSIVE AND ENERGETIC MATERIALS: A REVIEW
Robert J. Spear and William S. Wilson Apr. 1982 65 p refs
(MLR-R-850; AR-003-031) Avail: NTIS HC A04/MF A01

The synthesis of energetic materials over the past 10-15 years has been reviewed. The areas in which most activity has occurred embrace six different classes of compounds: polynitroaliphatics, dinitrifluoromethyl compounds, difluoramines, compounds, azido compounds, polynitroaromatics and heterocyclic compounds. Each class is treated within a single section covering the synthesis of the basic building-block materials, the strategies for transforming these into the final products and the scope and limitations of the reactions carried out. Most of the literature covered deals with new compounds but new or improved syntheses of compounds already known to possess useful properties are also described. Finally, developments in the prediction of explosive properties from molecular structure/composition are dealt with more briefly.Author

N83-14293*# Chem Systems, Inc., New York.
TECHNICAL AND ECONOMIC ASSESSMENT OF PROCESSES FOR THE PRODUCTION OF BUTANOL AND ACETONE Final Report
Sep. 1982 77 p refs Prepared for JPL
(Contracts NAS7-100; JPL-956277)
(NASA-CR-169623; NAS 1.26:169623) Avail: NTIS HC A05/MF A01 CSCL 21D

This report represents a preliminary technical and economic evaluation of a process which produces mixed solvents (butaol/acetone/ethanol) via fermentation of sugars derived from renewable biomass resources. The objective is to assess the technology of producing butanol/acetone from biomass, and select a viable process capable of serving as a base case model for technical and economic analysis. It is anticipated that the base case process developed herein can then be used as the basis for subsequent studies concerning biomass conversion processes capable of producing a wide range of chemicals. The general criteria utilized in determining the design basis for the process are profit potential and non-renewable energy displacement potential. The feedstock chosen, aspen wood, was selected from a number of potential renewable biomass resources as the most readily available in the United States and for its relatively large potential for producing reducing sugars. Author

N83-14294# Naval Research Lab., Washington, D. C.
THE EFFECT OF ADDITIVES ON THE AEROSOLIZATION OF JP-5 JET FUEL Final Report
R. C. Little, R. Pratt, and J. B. Romans 25 Aug. 1982 33 p refs
(AD-A119324; NRL-MR-4694) Avail: NTIS HC A03/MF A01 CSCL 21/4

The May spinning top aerosol generator was used to generate aerosols from neat Navy jet fuel and selected dispersions of three types of polymer additives in the jet fuel. The additives selected were Oppanol B-200, a Vistanex Series, and a proprietary antimisting additive designated as FM-9. The mass median diameter (MMD) of the droplets produced was studied as a function of additive concentration and spinning top velocity for each additive. In the case of each additive the MMD significantly increased with concentration at constant RPS. The effect of the Oppanol B-200 was comparable to that of FM-9 with respect to its influence on the MMD. GRA

N83-14295# Spectron Development Labs., Inc., Costa Mesa, Calif.
AERODYNAMIC DROPLET BREAKUP Annual Technical Report
J. E. Craig 24 May 1982 18 p
(AD-A119219; SDL-82-2193-06; AFOSR-82-0694TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

A three-phase experimental investigation of the physical characterization of liquid droplet behavior within the nozzle contraction were described. These processes are inherently dependent. Initial deformations which result in increased accelerations and decreased slip velocity affect the droplet condition at the point of fragmentation. In the initial experiment, conventional liquids were used to study the effects of two liquid properties, namely surface tension and viscosity. Holographic observation of the droplet acceleration, deformation and fragmentation processes within the nozzle contraction were recorded. Holographic observations revealed the dramatic increase in droplet acceleration caused by the initial deformation. Later observations revealed classical breakup mechanisms and finally the fragment size distribution was determined. GRA

N83-14296# Army Missile Command, Redstone Arsenal, Ala. Propulsion Directorate.
DESIGN OF SOLID PROPELLANT GRAINS USING THE HEWLETT-PACKARD 41C CALCULATOR
James C. Hodges, Jr. Mar. 1982 37 p refs
(AD-A119646; AD-E950284; DRSMI/TR-RK-82-3) Avail: NTIS HC A03/MF a01 CSCL 19/1

This report describes the solution of a typical solid propellant grain design requirement using the Hewlett-Packard 41C hand held calculator and a program for the solution of Wagon Wheel, Modified Wagon Wheel and Star Grain designs. A grain design for an experimental rocket, PLUME is given. The HP41C program is given in Appendix A. Author (GRA)

N83-14297# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
AN INVESTIGATION OF EXPERIMENTAL TECHNIQUES FOR OBTAINING PARTICULATE BEHAVIOR IN METALLIZED SOLID PROPELLANT COMBUSTION Final Report, Feb. 1980 - Dec. 1981
S. G. Karagounis, V. D. Diloreto, T. R. Gillespie, II, E. Dubrov, P. J. Hickey, and D. W. Netzer Jul. 1982 152 p refs
(Contracts F04611-80-X-0032; F04611-81-X-0003; F04611-81-X-0066; F04611-82-X-0008)
(AD-A119422; AFRPL-TR-82-51) Avail: NTIS HC A08/MF A01 CSCL 21/9

The goal of this initial investigation was to develop and compare experimental techniques that could be used for obtaining quantitative data on the effects of propellant properties, operating pressure and nozzle geometry on the behavior of metallized particulates within the grain port and nozzle of solid propellant rocket motors. The techniques employed were high speed motion pictures of strand burners and slab burners in a cross-flow environment, SEM analysis of post-fire residue (strand, slab, and motor), determination of D32 at the exit of an exhaust nozzle using measurements of scattered laser power spectra, and holograms of burning propellant strands and slabs in a cross-flow environment. All techniques were successfully developed and employed to obtain particulate size data from a series of specially formulated propellants. The motion picture and holographic techniques were successfully demonstrated for operating pressures of 34 and 68 atm. and with up to 15% aluminum. Fourteen micrometer resolution was obtained in the

high speed motion pictures with a 1.12X magnification (and very small depth of field) and eleven micrometer resolution was obtained in the holograms. Measurements of D32 at the nozzle exit plane of a small end-burning motor were in close agreement with size analysis of collected exhaust particulates. Author (GRA)

N83-14298# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
A COMPARATIVE STUDY OF VERY HIGH BURNING RATE MATERIALS: HIVELITE COMPOSITIONS 300511 AND 300435
L. Avrami, R. Velicky, D. Anderson, and D. Downs Aug. 1982 54 p refs
(Contract MIPR-N-60921-81-RD-015)
(AD-A119403; AD-E400886; ARLCD-TR-82015) Avail: NTIS HC A04/MF A01 CSCL 19/1

A series of safety and characterization tests were performed on a very high burning rate (VHBR) HIVELITE 300511 composition (Teledyne McCormick Selph product) in order to provide sufficient data so that a judgment can be made to qualify the material for in-service use. This composition is claimed to be less sensitive to electrostatics than HIVELITE 300435, a similar composition. The results of HIVELITE 300511 are compared to those for HIVELITE 300435. The range of tests include impact sensitivity, electrostatic sensitivity, friction sensitivity, autoignition, explosion temperature, coefficient of thermal expansion, effect of moisture, growth effects, burn rate tests and closed bomb results. Similar results were obtained with perforated and solid pellets in the modified version of the TMcS standard primer acceptance test to determine the burn rate measurement in open air. However, different results were obtained with larger diameters of solid pellets. The burning progression rates reduced drastically for solid pellets that were coated with hot black asphalt paint to inhibit the surface burning. A significant difference was also noted in the closed bomb testing when compared to the TMcS data. On an overall basis, HIVELITE 300511 is not as sensitive to impact, friction, and electrostatics as HIVELITE 300435. Although the sensitivity to electrostatics has been reduced by a factor of almost 10 for HIVELITE 300511, the material still must be handled as a primary explosive. Sufficient data has been obtained to evaluate HIVELITE 300511 for interim qualification for in-service use. GRA

N83-14299# Carnegie-Mellon Univ., Pittsburgh, Pa. Center for Energy and Environmental Studies.
PROGRAM OF BASIC RESEARCH ON THE UTILIZATION OF COAL-WATER MIXTURE FUELS Quarterly Report, period ending 30 Sep. 1981
E. Z. Casassa, J. Padmanban, G. D. Parfitt, S. A. Rao, E. S. Rubin, H. T. Sommer, and E. W. Toor 1981 18 p refs
(Contract DE-FG22-81PC-40285)
(DE82-002232; DOE/PC-40285/T1) Avail: NTIS HC A02/MF A01

Two areas of special importance to the successful use of coal-water slurries are discussed: mixture stability and atomization. Activities in the study of mixture stability are reviewed. The atomization of coal-water slurries is discussed. DOE

N83-14300# United Technologies Research Center, East Hartford, Conn.
REACTION-INDUCED TEMPERATURE DEVIATIONS DURING COAL DEVOLATILIZATION IN A HEATED GRID
J. D. Freihaut, M. F. Zabielski, and D. J. Seery 1981 10 p refs
(Contract DE-AC21-81MC-16221)
(DE82-003864; DOE/MC-16221/T5) Avail: NTIS HC A02/MF A01

The effects of sample characteristics on local heating of the grid were examined to assess the influence of devolatilization on programmed heating rates. The devolatilization process on the time temperature history of the local screen in immediate contact with the sample was determined. With respect to the coal particles, the direct implication is that the temperature path is the resultant of several components: the resistive heating of the grid, the physical properties of the samples, the devolatilization properties of the sample. Once the range of devolatilization temperatures of a particular coal is achieved, the primary devolatilization process appears to dominate the temperature-time trajectory. In addition, the data appears to indicate that the heat requirement varies with the rank characteristics of the coal. The tar release is closely coupled in time to the devolatilization-induced temperature deviations during primary devolatilization and the onset of the tar release significantly precedes the slower light hydrocarbon gas evolution. GRA

N83-14301# Pennsylvania State Univ., University Park. Dept. of Mineral Engineering.
EXPANSION OF COAL-PREPARATION-PLANT SIMULATOR Progress Report, 1 Jul. - 30 Sep. 1981
P. T. Luckie and L. G. Austin 1 Oct. 1981 19 p refs
(Contract DE-AC22-80PC-30144)
(DE82-001576; DOE/PC-30144/T5) Avail: NTIS HC A02/MF A01

Progress in the development and testing of modules for a centrifuge and a vacuum filter is reported. These modules have the following special characteristics: comminution and size degradation calculations for the centrifuge; loss of fines to the filtrate and centrate liquors and subsequent change in particle size distributions; calculation of equilibrium moisture content for the finished cake; and estimation of the final moisture content based on the equilibrium moisture content and the time the coal particles are exposed to the desaturating forces. The modules were incorporated into the main simulation program and tested using three typical feeds for coal preparation plants. Results were good with the exception of the calculation of the equilibrium moisture content. The final summary reports were expanded to include overall flow rates of clean coal, middling and refuse leaving the plant; overall yield data; and overall economic (cost) data. The economic calculations require a knowledge of the hourly tonnage of raw coal entering the plant, the number of hours of operation per week, and an overall annualized cost. DOE

N83-14302# Oak Ridge National Lab., Tenn.
HEALTH EFFECTS RESEARCH IN DIRECT COAL LIQUEFACTION. STUDIES OF H-COAL DISTILLATES. PHASE 1: PDU SAMPLES; THE EFFECTS OF HYDROTREATMENT
J. L. Epler, R. J. M. Fry, and F. W. Larimer Nov. 1981 66 p refs
(Contract W-7405-eng-26)
(DE82-003702; ORNL/TM-8071) Avail: NTIS HC A04/MF A01

A multi-divisional effort aimed at the integrated assessment of the health and environmental effects of various coal conversion and shale oil technologies is discussed. The feasibility of using health effects bioassays to predict the potential biohazard of various H-Coal derived test materials is examined in a coupled chemical and biological approach. The primary focus is the use of preliminary chemical characterizations and preparation for bioassay, followed by testing in short-term assays in order to rapidly ascertain the potential biohazard. Mammalian toxicological assays parallel the testing. Raw and hydrotreated product liquids from process development units of H-Coal and the pilot plan solvent refined coal process were examined for acute toxicity monitored as population growth impairment of Tetrahymena exposed to aqueous extracts and for mutagenic activity monitored as revertants of Salmonella exposed to metabolically activated chemical class fractions. Medium to high severity hydrotreatment appears to be an effective means of reducing biological activity. DOE

N83-14303# Brookhaven National Lab., Upton, N. Y.
HYDROGEN RECOVERY FROM SUPPLEMENTED NATURAL GAS BY METAL HYBRIDES
D. T.-J. Huang, F. Reidinger, and F. B. Hill 1981 7 p refs Presented at the Ann. Contractors' Rev. Meeting on Thermal and Chem. Storage, Tysons Corner, Va., 16 Sep. 1981
(Contract DE-AC02-76CH-00016)
(DE82-002245; BNL-30057; CONF-810940-28) Avail: NTIS HC A02/MF A01

A metal hydride process employing LaNi4 7Al0 3 for recovery of hydrogen from supplemented natural gas is discussed. Exper-

imental studies involved determination of the equilibrium hydrogen capacity of the alloy, measurement of the adsorption behavior of contaminant gases, and measurement of rates of hydrogen absorption by the alloy. The results were used as the basis for a preliminary process design and cost estimate. DOE

N83-14304# European Space Agency, Paris (France).
A NEW APPROACH TO THE PERFORMANCE EVALUATION OF SATELLITE PROPELLANT-STORAGE SYSTEMS
P. Erichsen (ESTEC, Noordwijk, Netherlands) and W. R. Burke, ed. May 1982 49 p refs
(ESA-STM-222; ISSN-0379-4075) Avail: NTIS HC A03/MF A01

A factor called propellant-storage effective velocity is defined as the ratio between total impulse and total mass. This factor characterizes the propulsive performance of a propulsive system better than the thruster exhaust velocity only. This concept is used to investigate the design parameters of propellant storage systems in order to give a propulsion system of minimum mass. Data which facilitate the selection of the kind of propellant for layout and design of satellite auxiliary propulsion systems are given. System velocity increment and total impulse capabilities are derived for compressed gases, vaporizing liquids, monopropellant hydrozine and bipropellants. Author (ESA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N83-14305*# Grumman Aerospace Corp., Bethpage, N.Y.
COMPOSITE BEAM CAP FABRICATOR EXPERIMENT DEFINITION STUDY, VOLUME 1 Final Report
23 Jul. 1982 151 p refs 2 Vol.
(Contract NAS8-32472)
(NASA-CR-170688; NAS 1.26:170688) Avail: NTIS HC A08/MF A01 CSCL 13H

The Composite Beam Cap Fabricator (CBCF), a part of a family of machines that was designed to develop and augment the technology of space fabrication (the automatic production of basic structural members in space is described. The major components of the CBCF are described. The mill weighs approximately 1400 pounds and its size is approximately 6 feet by 2 feet by 2 feet. It is a microprocessor under a low cost-of-concept type of contract. Consequently, all components are made of commercially available hardware. Neither weight nor volume constraints were considered during the development of the machine. For example, over 3/4 of the volume enclosed by the controller units is empty. R.J.F.

N83-14306# Naval Postgraduate School, Monterey, Calif.
THE USE OF BUOYANCY TO LIFT HEAVY OBJECTS FROM THE SEA M.S. Thesis - MIT
Richard Paul Fiske Jun. 1981 138 p refs
(AD-A119320) Avail: NTIS HC A07/MF A01 CSCL 13/10

To recover oil from economically marginal offshore fields the re-use of production platforms has been considered. Re-use involves severing the jacket from the seabed, rotating the jacket to the horizontal and lifting it through the air/sea interface in a configuration suitable for towing. Five systems are considered for use in the recovery process. Two systems currently used for installation are found suitable for modification to recover jackets. They are the pontoon barge system and the self-floating tower. Major problems to be overcome in modifying for retraction are mating of the pontoon barge with the tower, developing a pile system which can be refurbished, and ensuring transverse stability on retraction through the air/sea interface. GRA

N83-14307# Newman and Hermanson Co., Washington, D.C.
THE IMPACT OF LAWS ON METRIC CONVERSION: A SURVEY OF SELECTED LARGE US CORPORATIONS Final Report
Feb. 1982 94 p Sponsored by the US Metric Board
(AD-A118602) Avail: NTIS HC A05/MF A01 CSCL 05/3

The purpose of the study was to determine the extent to which a sample of the Fortune 1000 firms perceived that legal impediments to metric conversion exists. The Fortune 1000 firms included in the study were: (a) the 41 firms which identified legal impediments to metric conversion in an earlier study report commissioned by the Board, U.S. Metric Board 1979 Survey of Selected Large U.S. Firms and Industries; and (b) 10 additional firms from the industry groups indicating some problems with laws and regulations. This study attempted to make several determinations among which were: whether or not legal impediments or perceptions of legal impediments to metric conversion exist; the correlation between metric planning and the perception that impediments exist; the distribution of perceived impediments among Federal, State and local laws; the nature of corporate lobbying activities; and corporate experiences in addressing legal impediments to conversion. GRA

N83-14308# Naval Research Lab., Washington, D. C. Combustion and Fuels Branch.
SCALE-MODELING OF INERT PRESSURANT DISTRIBUTION AS APPLIED TO FIRE EXTINGUISHMENT BY NITROGEN PRESSURIZATION Final Report
J. P. Stone, F. W. Williams, H. W. Carhart, and R. C. Corlett (Washington Univ.) 20 Sep. 1982 9 p refs
(RR01301144)
(AD-A119556; NRL-8609) Avail: NTIS HC A02/MF A01 CSCL 21/2

An approximate method for scale-modeling inert pressurant distribution in geometrically similar enclosures is applied with length scale factors of 3.84, 6, and 23 (prototype to model) for turbulent flow conditions. Modeling correlations are best in spaces with minimal clutter (no obstructions to flow). With considerable clutter, however, correlations were considered acceptable and indicated good mixing within less than an additional injection time. GRA

N83-14309# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
IN-SITU DETERMINATION OF MOISTURE IN ROAD PAVEMENT BY NUCLEAR METHODS
G. W. Gray, B. D. Sowerby, and G. P. Youdale Apr. 1981 21 p refs
(DE81-700667; AAEC/E-511; ISBN-0-642-59710-3) Avail: NTIS (US Sales Only) HC A02/MF A01

The use of neutron moisture probes to determine moisture in compacted pavement layers has been studied on samples representative of those used by the New South Wales Department of Main Roads for roadway construction. The aim of this work was to measure the average moisture content of the upper layer (15-20 cm thick) with minimum interference from moisture in underlying layers. Subsurface probes using high (alpha Be) and low (alpha Li) energy neutron sources were examined; conventional alpha Be sources in specially designed compact probes should result in an error due to base moisture and density variations of less than 0.4 wt % moisture. As this error is probably less than those due to sampling and geometry variations in the field, such a probe should be sufficiently accurate for DMR requirements. If less sensitivity to base moisture is required, the alpha Li source will reduce this sensitivity by a factor of about 1.4. DOE

N83-14310# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
DEVELOPMENT OF PLANT MONITORING WITH ON-LINE TECHNIQUES [SVILUPPO DELLA SORVEGLIANZA DEGLI IMPIANTI CON TECHNICHE DI MONITORAGGIO ON-LINE]
S. Ghia, G. Possa, V. Regis, and F. Tonolini 1982 32 p refs In ITALIAN Presented at 1st Natl. Conv. Le Prove non Distruttive nella Sorveglianza degli Impianti, Siracusa, Italy, 17-18 May 1982
(Contract ENEL-2E/000)
(CISE-1793) Avail: NTIS HC A03/MF A01

The real time definition of a plant state by on-line monitoring of mechanical stress, leak detection and component control is discussed. Continuous on-line monitoring, using strain measurement, is reviewed. The use of capacitive strain gages for high

temperature applications is examined. Mechanical and structural control, vibration monitoring and leak detection by acoustic emission techniques are described. Data acquisition and data processing systems for acoustic emission monitoring techniques are discussed. Author (ESA)

N83-14311# Centre Technique des Industries Mecaniques, St. Etienne (France).
THEORETICAL AND EXPERIMENTAL STUDY OF THE MAIN FAULTS FOUND IN COLD FORGING Final Report [ETUDE THEORIQUE ET EXPERIMENTALE DES PRINCIPAUX DEFAUTS RENCONTRES EN FORGE A FROID]
J. F. Renaudin 8 Jul. 1982 15 p refs In FRENCH
(Contract DGRST-79.7.09.10)
(CETIM-1-3L-12-1) Avail: NTIS HC A02/MF A01

A theoretical study on the appearance of faults in cold forged metals was carried out, based on the upper bound and Hill methods, in order to provide a defects forecasting method. An experimental study was conducted in parallel using several extrusion procedures and materials, in particular XC10 steel. The theoretical studies did not reach a satisfactory conclusion. Valid observations from the experimental campaign, including the conditions in which hydraulic pressing extrusion defects are produced (e.g., the metal-die friction coefficient) die geometric characteristics and the total length of metal filling the die are reported. Author (ESA)

N83-14312# Escher Technology Associates, St. Johns, Mich. Div. of Paper Machines.
AIR CIRCUIT WITH HEAT PUMP
H. Holik, H. J. Bauder, H. Brugger, A. Reinhart, and K. H. Spott Dec. 1980 39 p refs Transl. into ENGLISH of "Luftkreislauf mit Warmepumpe" rept. Bundesministerium fuer Forschung und Technologie, Bonn Original language document was announced as N82-12404
(PB82-221219; BMFT-FB-T-80-188) Avail: NTIS HC A03/MF A01 CSCL 13A

In the production of paper, a water quantity of approximately 1.5 times the weight of the finished paper is vaporized. The energy needed for this is lost in the ensuing water vapor during the drying process. It is demonstrated that energy consumption in drying paper can be reduced by using a heat pump to heat the blown air instead of the conventional steam heating. The exhaust from the drying section serves to supply heat for the pump. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N83-14313 British Broadcasting Corp., Kingswood (England). Engineering Div.
TEST ON EIGHT VIDEO pcM CODECS IN TANDEM HANDLING COMPOSITE PAL AND MONOCHROME VIDEO SIGNALS
V. G. Devereux Oct. 1982 30 p refs
(BBC-RD-1982/19) Avail: BBC, Kingswood Warren, Tadworth, Surrey, Engl.

The performance of up to eight pulse code modulation video analogue-to-digital and ditial-to-analog converters (codecs) in tandem, each employing 8 bits per sample, was examined by means of subjective tests and objective measurements. In the subjective tests, a sampling frequency of 12 MHz was employed for coding System I (625-line, 5.5 MHz) pulse code modulation color and monochrome video signals. Conclusions are given regarding the minimum sampling frequency, number of bits per sample, specifications of video low pass filters, and coding accuracy for video pulse code modulation codecs handling broadcast-quality video signals. Author

N83-14314 Stanford Univ., Calif.
REMOTE SENSING OF THE DIRECTIONAL OCEAN WAVE SPECTRA USING HF BACKSCATTER RADAR Ph.D. Thesis
Abdelrahman Mohamed Elabdalla 1982 96 p
Avail: Univ. Microfilms Order No. DA8220453

Superresolution spectrum estimation techniques used in the remote sensing of the wave-height (DOWS) using HF backscatter radar were studied. The techniques investigated directional ocean wave spectrum are: (1) multiple signal classification (MUSIC), (2) maximum entropy (ME), and (3) maximum likelihood (ML). Two unbiassed estimates of the directional spectrum based on the MUSIC and the ML algorithms were developed and implemented. The estimates of the DOWS using such techniques were compared with estimates using synthetic aperture radar. The comparison showed good agreement in estimating the mean direction of energy and the half power width. The advantages of using superresolution techniques are: (1) no assumptions need to be made about the shape of the spectrum and (2), if the ship (radar) is moving in a straight line, the spectrum estimate is not affected as long as the ship speed is less than the phase velocity of the ocean waves. Dissert. Abstr.

N83-14315 Princeton Univ., N. J.
THE DETECTION OF SIGNALS IN IMPULSIVE NOISE Ph.D. Thesis
Emil Joseph Modugno, III 1982 186 p
Avail: Univ. Microfilms Order No. DA8221582

The detection of known, discrete time signals in additive non-Gaussian noise was investigated. The case of statistically independent samples is emphasized. After a brief introduction to the detection problem, the characteristics and sources of impulsive noise are discussed. Several models for impulsive noise are then presented. The complexity of these models and the need for simple density functions to approximate the first order characteristics of impulsive noise justify consideration of three systems of densities. These three systems are: a generalized Gaussian noise, the Johnson S sub u System, and a mixture model. Dissert. Abstr.

N83-14316 Defence Research Information Centre, Orpington (England).
ELECTROMAGNETIC HAZARDS IN SAFE ZONES IN THE VICINITY OF TRANSMISSION STATIONS
H. Korniewicz Aug. 1982 21 p refs Transl. into ENGLISH from Przeglad Telekomunikacyjny (Poland), v. 54, no. 3, 1981 p 81-85
(DRIC-T-6706; BR84486) Copyright. Avail: Issuing Activity

In order to provide protection to the personnel of the transmitting station and people living in the neighborhood of such stations, regulations were introduced in Poland encompassing areas of strong electromagnetic fields in which people should spend only limited periods of time. Case studies show that beyond the protected zones, in the so-called safe zones, phenomena of marked concentration and accumulation of electromagnetic energy emitted by the transmitting stations occur. These can cause electric shocks, trigger off electric detonators, ignite highly inflammable mixtures and may expose humans to electric fields of harmful intensity. Author (ESA)

N83-14317 Defence Research Information Centre, Orpington (England).
MICROWAVES (INCLUDING RADAR) AND PROTECTION AGAINST RADIATION
F. Kossel Aug. 1982 9 p refs Transl. into ENGLISH from Arbeitsmed. Sozialmed. Praeventivemed. (West Germany), v. 16, no. 2, 1981 p 39-42
(DRIC-T-6741; BR84636) Copyright. Avail: Issuing Activity

A directive by the Commission of the European Communities for protection against microwaves is outlined, and the nature of microwaves, and possible protection methods are discussed. Devices which utilize microwaves are reviewed. The health risks from these forms of radiation are discussed, and safety limits are considered. A limit value of 10 mw/sqcm is specified. Author (ESA)

N83-14318# Norwegian Defence Research Establishment, Kjeller.
APPLICATION OF SATELLITE-BASED SIDELOOKING RADAR IN MARITIME SURVEILLANCE
Einar-Arne Herland Sep. 1982 110 p refs
(NDRE/PUBL-82/1001; ISSN-0085-430i) Avail: NTIS HC A06/MF A01

A satellite borne synthetic aperture radar (SAR) system for maritime surveillance is investigated. The system is analyzed, and algorithms for digital processing of SAR images from the raw data are developed. These algorithms are implemented on a general purpose computer and applied to data from SEASAT-1. An autofocusing algorithm for the azimuth compression is developed whereby SAR images can be processed without any additional information on satellite orbit and attitude. This makes operational use of satellite borne SAR feasible. A method for target detection from SAR images is also developed. S.L.

N83-14319*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
RF MODEL OF THE DISTRIBUTION SYSTEM AS A COMMUNICATION CHANNEL, PHASE 2. VOLUME 1: SUMMARY REPORT Final Report
R. C. Rustay, J. T. Gajjar, R. W. Rankin, R. C. Wentz, and R. Wooding 28 Jul. 1982 119 p refs Prepared for JPL 4 Vol.
(Contract JPL-955647)
(NASA-CR-169626; NAS 1.26:169626; SRD-82-055-1-Vol-1) Avail: NTIS HC A06/NF A01 CSCL 17B

The design, implementation, and verification of a computerized model for predicting the steady-state sinusoidal response of radial (tree) configured distribution feeders was undertaken. That work demonstrated the feasibility and validity based on verification measurements made on a limited size portion of an actual live feeder. On that basis a follow-on effort concerned with (1) extending the verification based on a greater variety of situations and network size, (2) extending the model capabilities for reverse direction propagation, (3) investigating parameter sensitivities, (4) improving transformer models, and (5) investigating procedures/fixes for ameliorating propagation trouble spots was conducted. Results are summarized. J.M.S.

N83-14320*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
RF MODEL OF THE DISTRIBUTION SYSTEM AS A COMMUNICATION CHANNEL, PHASE 2. VOLUME 2: TASK REPORTS Final Report
R. C. Rustay, J. T. Gajjar, R. W. Rankin, R. C. Wentz, and R. Wooding 28 Jul. 1982 313 p refs Prepared for JPL 4 Vol.
(Contract JPL-955647)
(NASA-CR-169627; NAS 1.26:169627; SRD-82-055-2-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 17B

Based on the established feasibility of predicting, via a model, the propagation of Power Line Frequency on radial type distribution feeders, verification studies comparing model predictions against measurements were undertaken using more complicated feeder circuits and situations. Detailed accounts of the major tasks are presented. These include: (1) verification of model; (2) extension, implementation, and verification of perturbation theory; (3) parameter sensitivity; (4) transformer modeling; and (5) compensation of power distribution systems for enhancement of power line carrier communication reliability. J.M.S.

N83-14321*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
RF MODEL OF THE DISTRIBUTION SYSTEM AS A COMMUNICATION CHANNEL, PHASE 2. VOLUME 3: APPENDICES Final Report
R. C. Rustay, J. T. Gajjar, R. W. Rankin, R. C. Wentz, and R. Wooding 28 Jul. 1982 79 p refs Prepared for JPL 4 Vol.
(Contract JPL-955647)
(NASA-CR-169628; NAS 1.26:169628; SRD-82-055-3-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 17B

Program documentation concerning the design, implementation, and verification of a computerized model for predicting the steady-state sinusoidal response of radial configured distribution feeders is presented in these appendices. J.M.S.

N83-14322*# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
RF MODEL OF THE DISTRIBUTION SYSTEM AS A COMMUNICATION CHANNEL, PHASE 2. VOLUME 4: SOFWARE SOURCE PROGRAM AND ILLUSTRATIONS ASCII DATABASE LISTINGS Final Report
R. C. Rustay, J. T. Gajjar, R. W. Rankin, R. C. Wentz, and R. Wooding 28 Jul. 1982 238 p refs Prepared for JPL 4 Vol.
(Contract JPL-955647)
(NASA-CR-169629; NAS 1.26:169629; SRD-82-055-4-Vol-4) Avail: NTIS HC A11/MF A01 CSCL 17B

Listings of source programs and some illustrative examples of various ASCII data base files are presented. The listings are grouped into the following categories: main programs, subroutine programs, illustrative ASCII data base files. Within each category files are listed alphabetically. J.M.S.

N83-14323*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION PROGRESS JOURNAL Progress Report, Jul. - Sep. 1982
N. A. Renzetti, ed. 15 Nov. 1982 187 p refs
(NASA-CR-169671; NAS 1.26:169671; JPL-PR-42-71) Avail: NTIS HC A09/MF A01 CSCL 17B

Developments in Earth based radio technology are reported. The Deep Space Network, radio interferometry, and observation of celestial radio sources are covered. For individual titles, see N83-14324 through N83-14343.

N83-14324*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DETERMINATION OF INTERCONTINENTAL BASELINES AND EARTH ORIENTATION USING VLBI **c46**
O. J. Sovers, J. L. Fanselow, G. H. Purcell, Jr., D. H. Rogstad, and J. B. Thomas *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 1-7 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 08G

A series of experiments was conducted during the last decade to explore the capability of very long baseline interferometry (VLBI) to measure the crustal and rotational motions of the Earth with accuracies at the centimeter level. The observing stations are those of NASA's Deep Space Network in California, Spain and Australia. A multiparameter fit to the observed values of delay and delay rate yields radio source positions, polar motion, universal time, the precession constant, baseline vectors, and solid Earth tides. Source positions are obtained with formal errors of the order of 0".01. UT1-UTC and polar motion are determined at 49 epochs, with formal error estimates for the more recent data of 0.5 msec for UT1-UTC and 2 to 6 mas for polar motion. Intercontinental baseline lengths are determined with formal errors of 5 to 10 cm. The Love numbers and Earth tide phase lag agree with the commonly accepted values. Author

N83-14325*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ERROR ESTIMATION FOR DELTA VLBI ANGLE AND ANGLE RATE MEASUREMENTS OVER BASELINES BETWEEN A GROUND STATION AND A GEOSYNCHRONOUS ORBITER **c13**
S. C. Wu *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 8-19 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 22A

Baselines between a ground station and a geosynchronous orbiter provide high resolution Delta VLBI data which is beyond the capability of ground-based interferometry. The effects of possible error sources on such Delta VLBI data for the determination of spacecraft angle and angle rate are investigated. For

comparison, the effects on spacecraft-only VLBI are also studied. Author

N83-14326*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN MONITOR AND CONTROL SYSTEM MARK III-82
G. L. Spradin *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 20-22 (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

A description of the DSN Monitor and Control System, Mark III-82 is presented. The major implementations required to evolve from the Mark III-80 to the Mark III-82 configuration are identified. Author

N83-14327*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMPROVED DOWNLINK FREQUENCY CALCULATIONS FOR VOYAGER 2
A. L. Ricardo *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 27-39 (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Voyager 2 and her sister Voyager 1 were launched, respectively, in August and September 1977. The object of these spacecraft was to conduct exploratory investigations of the Jupiter and Saturn planetary systems and the interplanetary medium between Earth and Saturn. In April 1978 the Boyager 2 redundant receiver and the loop capacitor in the prime spacecraft receiver failed, leaving the Voyager Project with a major problem: how to communicate with the spacecraft and get the data back. Author

N83-14328*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE PERFORMANCE OF VLA AS A TELEMETRY RECEIVER FOR VOYAGER PLANETARY ENCOUNTERS **c17**
L. J. Deutsch *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 27-39 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09F

The Very Large Array (VLA) was proposed for use as a supplement to the Deep Space Network (DSN) for telemetry reception at Voyager 2 Uranus and Neptune encounters. The main problem with the use of VLA for telemetry is that it is not capable of producing a continuous stream of data. Gaps of one millisecond follow every 51 milliseconds of data. The effect of these millisecond gaps on coded telemetry is investigated. An upgapped system of the same aperture as the VLA would be capable of handling data rates of 38.4 kbps at Uranus encounter and 19.2 kbps at Neptune encounter. It is shown that VLA with (7, 1/2) convolutional coding (the baseline coding scheme for Voyager) will support a data rate of 10.8 kbps but not 19.2 kbps at both Uranus and Neptune. It is also shown that by implementing Voyager's concatenated Reed-Solomon/convolutional coding capability, data rates of 38.4 kbps and 19.2 kbps would be achievable at Uranus and Neptune respectively. Concatenation also offers a factor of 2 improvement in overall throughput. Author

N83-14329*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE OF DIFFERENCED RANGE DATA TYPES IN VOYAGER NAVIGATION
T. H. Taylor, J. K. Campbell, R. A. Jacobson, B. Moultrie, R. A. Nichols, Jr., and J. E. Riedel *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 40-52 refs Previously announced as A82-38893 (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Voyager radio navigation made use of a differenced rage data type for both Saturn encounters because of the low declination singularity of Doppler data. Nearly simultaneous two-way range from two-station baselines was explicitly differenced to produce this data type. Concurrently, a differential VLBI data type (DDOR), utilizing doubly differenced quasar-spacecraft delays, with potentially higher precision was demonstrated. Performance of these data types is investigated on the Jupiter-to-Saturn leg of Voyager 2. The statistics of performance are presented in terms of actual data noise comparisons and sample orbit estimates. Use of DDOR as a primary data type for navigation to Uranus is discussed. Author

N83-14330*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL BACKGROUND NOISE LIMITATIONS
S. Gulkis *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 53-59 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

Modern detection systems are increasingly limited in sensitivity by the background thermal photons which enter the receiving system. Expressions for the fluctuations of detected thermal radiation are derived. Incoherent and heterodyne detection processes are considered. References to the subject of photon detection statistics are given. Author

N83-14331*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
K SUB A-BAND WEATHER-DEPENDENT SYSTEM PERFORMANCE ESTIMATES FOR GOLDSTONE
R. C. Clauss, M. M. Franco, and S. D. Slobin *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 60-65 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 20N

A K sub A band atmospheric noise temperature and attenuation statistical model is developed for Goldstone, based on water vapor radiometer measurements at 31.4 GHz made during winter and spring 1981. An equivalent X-band model is derived from these measurements, and the two sets of data are compared to determine the possible advantages of developing DSN telecommunications links at 32 GHz. For a nominal elevation angle of 30 degrees and identical antennas, it is found that a K sub A band system at Goldstone will show a 5 to 1 dB signal-to-noise ratio advantage oer an X-band system more than 99 percent of the time. Author

N83-14332*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
X-BAND NOISE TEMPERATURE EFFECTS OF RAIN ON DSN ANTENNA FEEDHORNS
S. D. Slobin, M. M. Franco, and R. C. Clauss *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 66-72 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 20N

Simulated rain tests were carried out to determine the noise temperature contribution of liquid water adhering to the aperture cover material on both a standard DSN X-band feedhorn and on an S/X-band common aperture feedhorn. It was found that for the particular common aperture feedhorn tested, system noise temperature increases were much greater when the plastic horn cover material was old and weathered than when it was new. The age and condition of the aperture cover material is believed to be a major factor in the amount of degradation experienced by a telecommunications system during rain events. Author

N83-14333*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VITERBI DECODER NODE SYNCHRONIZATION LOSSES IN THE REED-SOLOMON/VETERBI CONCATENATED CHANNEL
L. J. Deutsch and R. L. Miller *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 73-80 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

The Viterbi decoders currently used by the Deep Space Network (DSN) employ an algorithm for maintaining node synchronization that significantly degrades at bit signal-to-noise ratios (SNRs) of below 2.0 dB. In a recent report by the authors, it was shown that the telemetry receiving system, which uses a convolutionally

encoded downlink, will suffer losses of 0.85 dB and 1.25 dB respectively at Voyager 2 Uranus and Neptune encounters. This report extends the results of that study to a concatenated (255,223) Reed-Solomon/(7, 1/2) convolutionally coded channel, by developing a new radio loss model for the concatenated channel. It is shown here that losses due to improper node synchronization of 0.57 dB at Uranus and 1.0 dB at Neptune can be expected if concatenated coding is used along with an array of one 64-meter and three 34-meter antennas. Author

N83-14334*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE OF CONCATENATED REED-SOLOMON/ VITERBI CHANNEL CODING
D. Divsalar and J. H. Yuen *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 81-94 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

The concatenated Reed-Solomon (RS)/Viterbi coding system is reviewed. The performance of the system is analyzed and results are derived with a new simple approach. A functional model for the input RS symbol error probability is presented. Based on this new functional model, we compute the performance of a concatenated system in terms of RS word error probability, output RS symbol error probability, bit error probability due to decoding failure, and bit error probability due to decoding error. Finally we analyze the effects of the noisy carrier reference and the slow fading on the system performance. Author

N83-14335*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELECTRONIC SIMULATION OF A BAROMETRIC PRESSURE SENSOR FOR THE METEOROLOGICAL MONITOR ASSEMBLY c35
C. N. Guiar and L. W. Duff *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 95-103 (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 14B

An analysis of the electronic simulation of barometric pressure used to self-test the counter electronics of the digital barometer is presented. The barometer is part of the Meteorological Monitor Assembly that supports navigation in deep space communication. The theory of operation of the digital barometer, the design details, and the verification procedure used with the barometric pressure simulator are presented. Author

N83-14336*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE FABRICATION AND SURFACE TOLERANCE MEASUREMENTS OF THE JPL CLEAR APERTURE MICROWAVE ANTENNA
J. Carpenter, S. Rocci, and C. T. Chian *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 104-116 ref (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 20N

Present ground station microwave antennas of the Deep Space Network are of the symmetric dual reflector (cassegrainian) type. An investigation is being made of alternative high-performance offset antenna designs which have a clear aperture (no reflector or structural blockage) with shaped reflector surfaces. A 1.5-m, 32-GHz clear aperture model was built for experimental studies. The unique processes of fabrication, surface measurement, and alignment are described. Author

N83-14337*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIRECT COMPARISON OF VIKING 2.3-GHz SIGNAL PHASE FLUCTUATION AND COLUMNAR ELECTRON DENSITY BETWEEN 2 AND 160 SOLAR RADII
A. L. Berman, J. A. Wackley, and W. H. Hietzke (TRW) *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 117-128 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 20N

The relationship between solar wind induced signal phase fluctuation and solar wind columnar electron density has been the subject of intensive analysis during the last two decades. In this article, a sizeable volume of 2.3-GHz signal phase fluctuation and columnar electron density measurements separately and concurrently inferred from Viking spacecraft signals are compared as a function of solar geometry. These data demonstrate that signal phase fluctuation and columnar electron density are proportional over a very wide span of solar elongation angle. A radially dependent electron density model which provides a good fit to the columnar electron density measurements and, when appropriately scaled, to the signal phase fluctuation measurements, is given. This model is also in good agreement with K-coronameter observations at 2 solar radii (2r0), with pulsar time delay measurements at 10r0, and with spacecraft in situ electron density measurements at 1 AU. Author

N83-14338*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEEP SPACE COMMUNICATIONS COMPLEX COMMAND SUBSYSTEM MARK IVA
W. G. Stinnett *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 129-136 (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 17B

The Deep Space Communications Complex Command Subsystem will require major changes for the Mark IVA era. A description of the subsystem and its assemblies is contained in this article. Author

N83-14339*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPACT PRESENTATION OF DSN ARRAY TELEMETRY PERFORMANCE c17
C. A. Greenhall *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 137-142 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09F

The telemetry performance of an arrayed receiver system, including radio losses, is often given by a family of curves giving bit error rate vs bit SNR, with tracking loop SNR at one receiver held constant along each curve. This study shows how to process this information into a more compact, useful format in which the minimal total signal power and optimal carrier suppression, for a given fixed bit error rate, are plotted vs data rate. Examples for baseband-only combining are given. When appropriate dimensionless variables are used for plotting, receiver arrays with different numbers of antennas and different threshold tracking loop bandwidths look much alike, and a universal curve for optimal carrier suppression emerges. Author

N83-14340*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEEP SPACE NETWORK UTILIZATION FOR FLIGHT PROJECTS, CALENDAR YEAR 1981 c81
C. L. Adkins and E. K. Goto *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 143-147 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 05A

A report on the utilization of the Deep Space Network during calendar year 1981 in support of all flight projects is presented. The network expended 63% of its total capability in support of Space Flight projects. L.F.M.

N83-14341*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MARK IVA MICROPROCESSOR SUPPORT c60
A. L. Burford *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 148-153 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09B

The requirements and plans for the maintenance support of microprocessor-based controllers in the Deep Space Network Mark

IVA System are discussed. Additional new interfaces and 16-bit processors have introduced problems not present in the Mark III System. The need for continuous training of maintenance personnel to maintain a level of expertise consistent with the sophistication of the required tools is also emphasized. Author

N83-14342*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A DSN OPTIMAL SPACECRAFT SCHEDULING MODEL c61
W. A. Webb *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 154-165 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09B

A computer model is described which uses mixed-integer linear programming to provide optimal DSN spacecraft schedules given a mission set and specified scheduling requirements. A solution technique is proposed which uses Bender's Method and a heuristic starting algorithm. Author

N83-14343*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POTENTIAL AVAILABILITY OF DIESEL WASTE HEAT AT ECHO DEEP SPACE STATION (DSS 12) c44
R. D. Hughes *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 166-182 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 10B

Energy consumption at the Goldstone Echo Deep Space Station (DSS 12) is predicted and quantified for a future station configuration which will involve implementation of proposed energy conservation modifications. Cogeneration by the utilization of diesel waste-heat to satisfy site heating and cooling requirements of the station is discussed. Scenarios involving expanded use of on-site diesel generators are presented. Author

N83-14344# Naval Research Lab., Washington, D. C.
THE APPLICATION OF FUZZY-SET THEORY TO THE BURN-THROUGH RANGE EQUATION Interim Report
F. Gross, D. J. Hanrahan, and S. T. Hood 14 Sep. 1982 22 p refs
(XF3437257)
(AD-A119557; NRL-8619) Avail: NTIS HC A02/MF A01 CSCL 17/4

Uncertainty of parameters in the burnthrough range equation is nonstatistical. Fuzzy-set theory may be a better means of treating such uncertainty than the usual personal-probability (degree-of-belief) approach. Analytical and computer methods are presented and exemplified for computation of the burnthrough range as a fuzzy quantity when some of the radar parameters are uncertain. The methods are generally applicable to any fuzzy equation where suitable substitutions can be made. Author (GRA)

N83-14345# European Space Agency, Paris (France).
SECOND ESTEC SPACECRAFT ELECTROMAGNETIC COMPATIBILITY SEMINAR
W. R. Burke, ed. Jul. 1982 206 p refs Partly in ENGLISH and FRENCH Seminar held at Noordwijk, Netherlands, 11-13 May 1982
(ESA-SP-170; ISSN-0379-6566) Avail: NTIS HC A10/MF A01

Management standards, specifications, and test facilities for spacecraft EMC programs were discussed. Electrostatic charging was considered. For individual titles, see N83-14346 through N83-14366.

N83-14346# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
EMC SYSTEM TEST PERFORMANCE ON SPACELAB
F. Schwan *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 3-18 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Electromagnetic compatibility testing of the Spacelab engineering model is discussed. Documentation, test procedures (including data monitoring and test configuration set up) and performance assessment approach are described. Equipment was assembled into selected representative flight configurations. The physical and functional interfaces between the subsystems were demonstrated within the integration and test sequence which culminated in the flyable configuration Long Module plus one Pallet. Author (ESA)

N83-14347# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
COMPATIBILITY, A REQUIREMENT FOR EMI SPECIFICATIONS
R. E. Harms *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 19-27 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Rules which improve the comparibility and compatibility of EMI specifications and EMI test reports are given. The constitution of a European electromagnetic compatibility working group is recommended in order to standardize specifications in the aerospace industry. Author (ESA)

N83-14348# Lockheed Missiles and Space Co., Sunnyvale, Calif.
THE EFFECTS OF MIL-STD-461B SPECIFICATION FOR SPACE APPLICATIONS
Victor Muzaffer Turesin *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 29-37 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

The effects of Parts 1 and 3 of MIL-STD-461B in relation to spacecraft and launch vehicles, including associated ground equipment are discussed. The newly imposed requirements of MIL-STD-461B and deleted and revised requirements of MIL-STD-461A are examined. Specification limit changes for conducted emission, radiation emission, and susceptibility requirements are compared. Author (ESA)

N83-14349# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
SPACELAB EMC DESIGN
Helmut Rempke *In* ESA 2nd ESTEC Spacecraft Electromag. Compability Seminar Jul. 1982 p 41-45 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Spacelab electrical bonds, grounding, power filters, harness design and safety margin/signal interfaces of EMC design features are discussed. Electromagnetic compatibility experience acquired with Spacelab is summarized. It is argued that MIL-STD-461 is useful only as a starting point for design. Design requirements should be established for each system, and detailed definitions of interfaces should be given to contractors. The combination of EMC and power quality requirements into one specification is suggested. Author (ESA)

N83-14350# European Space Research and Technology Center, Noordwijk (Netherlands).
TWO WIRE COUPLING
M. Mensa *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 47-61 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Starting from a circuit (lumped) model, valid in the low frequency limit, and extending this to higher frequencies, the exact description of a two wire coupling in terms of its admittance matrix is obtained. The voltages at the ends of the victim wires are obtained as transfer functions of the voltage at the source end of the culprit wire. These transfer functions are studied with various load resistor values, and plots are provided. Approximate formulas to express the transfer functions are obtained. These formulas have an extended range of validity with respect to the well known one obtained from capactive and inductive coupling models.
Author (ESA)

N83-14351# White (Don) Consultants, Inc., Gainesville, Va.
INTERACTIVE GRAPHICS FOR SPACECRAFT DESIGNERS
Donald R. J. White *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 63-66 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Interactive graphics developed for electromagnetic interference (EMI) control in spacecraft design and installation stages are described. A menu of programs is presented and the user identifies sources of EMI within the equipment concerned. Selectable radiated emission specification limits are offered. All input data are displayed, to allow the user to verify or to add more data. The largest internal source of radiation and options to deal with it, in order of viability, are then shown. Author (ESA)

N83-14352# Centre National d'Etudes Spatiales, Toulouse (France).
EXAMPLE OF UTILIZATION OF THE PROGRAM EMC
Christian Predine *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 67-72 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

A computer program for analysis and prediction of conducted electromagnetic interference (EMI) in circuit, equipment or system interconnections is illustrated. It can analyze direct coupling by common impedance, common ground coupling, and crosstalk between cables. Data input consists of a text file in which the user describes an electrical network including lumped components, cables or EMI sources. The printout is a simulated voltage or current measurement performed with an oscilloscope for time domain displays or with a spectrum analyzer for frequency domain displays (narrowband or broadband results). Analysis of a SPOT satellite unit which did not meet conducted susceptibility requirements is shown. Author (ESA)

N83-14353# Centre National d'Etudes Spatiales, Toulouse (France).
A MODEL FOR SOLAR CELLS
J.-P. Catanai *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 73-78 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

A solar cell electrical model which gives a voltage and temperature function with parameters constant for a given cell is proposed. It is valid from dc to a few megahertz for EMC analysis. The admittance components Gp and Cp are derived from a theoretical study of the junction. The conductance Gp consists of four terms in parallel where exponential laws come from recombination phenomena near the junction and outside the depletion domain. Two terms for the capacitance Cp represent the barrier and the diffusion capacitance. The Gp (v) and Cp (v) functions are determined by measurements of the impedance variation with frequency by means of a network analyzer at fixed dc polarization voltage values. The cell model constants are computed by a least square regression on Cp (v) and Gp (v) functions. Experimental results prove that ambiant temperature measurements are sufficient to determine the cell parameters used to calculate Cp and Gp at any temperature or voltage. Author (ESA)

N83-14354# White (Don) Consultants, Inc., Gainesville, Va.
TRANSFER IMPEDANCES OF BALANCED SHIELDED CABLES
Michel Hardiguian *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 81-84 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

The transfer impedance concept is extended to balanced shielded cables, e.g., shielded pairs and twinax in which the actual voltage developed at the load, between the two wires of a pair is emphasized. This parameter can be computed by a separate knowledge of the shield, and the shield-to-pair coupling (i.e., the pair unbalance ratio). Thus, a unique parameter called shield coupling evolves which relates directly the shield current to the differential output voltage. Conditions of cable pair and harness shielding and the impact of grounding at one or both ends are discussed. Author (ESA)

N83-14355# Centre National d'Etudes Spatiales, Toulouse (France).
FILTERING OF INTERFERENCE IN THE COMMON MODE OF dc-dc CONVERTERS [FILTRAGE DU PARASITAGE EN MODE COMMUN DANS LES CONVERTISSEURS DC-DC]
Pierre Couvegnes *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 85-89 In FRENCH (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

The elimination of interference in power cables and in networks within mechanical systems is discussed. The interference injection mechanism, and the composition and theoretical basis of the filter with the best electrical performance are described. The filter optimization program is outlined, and results for converters used in space flight are mentioned. Author (ESA)

N83-14356# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
SPACELAB EMC DESIGN
Helmut Rempke *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 91-95 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Experience gained during electromagnetic compatibility tests on Spacelab is summarized. Extended conducted tests at system level provide good information for system performance. This is valid for emission as well as for susceptibility. System aspects can be investigated in addition to the information from equipment level testing. Radiated tests at system level can be reduced. No H-field measurements are required if there are no special cleanliness requirements. Standard test methods can be used for measurements on large systems. Problems needing special solutions for Spacelab are: injection transformer for high dc current power bus; current probe operation on high dc power buses; and E-Field environment reduction. System-level test results deviate significantly from results obtained on equipment level, especially for radiated emission test. System level tests may help to accept exceeding of limits on equipment level. Author (ESA)

N83-14357# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
LESSONS LEARNED FROM MARECS AND ECS EMC SYSTEM TESTS
I. D. Clough *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 97-103 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

The advantages to spacecraft EMC control of comparing cable-coupled emission levels, measured by test probes mounted on the cable harnesses of MARECS and ECS with predictions obtained by SEMCAP modelling are shown. The use of simple tests and deductions to investigate discrepancies is advocated. The MARECS-ECS experience enabled common resistance coupling to be determined and showed that misleading effects of high background emissions were probably due to Earth loops in the test configuration. It highlighted difficulties in interpreting measurements made by photographic recording of spectrum analyzer displays, and underlined the logical implications of the variability of the bundle-shielding effect on the EMC validation of sister spacecraft. Author (ESA)

N83-14358# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
SPECIAL TEST EQUIPMENT (STE) FOR SPACELAB EMC SYSTEM TESTS
H. Kraft *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 107-110 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

A high energy spark generator (25kV, 1 J) for testing radiated

arc discharge susceptibility to broadband emission, and a high current injection transformer (400 A dc) for tests of low frequency conducted susceptibility to sine waves are described. Development, manufacture and operational tests are discussed.
Author (ESA)

N83-14359# European Space Research and Technology Center, Noordwijk (Netherlands).
AUTOMATIC CONDUCTED SUSCEPTIBILITY TESTING
J. A. Steinz *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 111-114 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Conducted susceptibility testing using programmable instrument controllers and minicomputers is discussed. This makes the test in the early design phase suitable to supply information which can be used to confirm a design concept or to allow deviation from this concept. Automatic testing avoids creating a susceptibility condition. To identify the correct threshold level is more important than an indication that the unit under test could not stand the required test level. Processing the test data in order to obtain an impedance plot and a data plot indicating the susceptibility area gives a more precise indication of the relationship between the design concept and the susceptibility area. Author (ESA)

N83-14360# Keene Corp., Norwalk, Conn. Ray Proof Div.
RF ANECHOIC CHAMBER TEST FACILITIES
Brian F. Lawrence *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 115-126 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Radio frequency anechoic test chamber design is discussed. Radar absorbing materials are described. Electromagnetic compatibility testing in anechoic chambers is introduced. Special purpose chambers, e.g., for investigating a compact frequency range are considered. Author (ESA)

N83-14361# Aeritalia S.p.A., Caselle Torinese (Italy). Gruppo Equipaggiamenti.
THE AUTOMATIC ELECTROMAGNETIC FIELD GENERATING SYSTEM
B. Audone and G. Gerbi *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 127-133 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

The technical study and the design approaches adopted for the definition of the automatic electromagnetic field generating system (AEFGS) dedicated to EMC susceptibility testing are presented. The AEFGS covers the frequency range 10 KHz to 40 GHZ and operates successfully in the two EMC shielded chambers at ESTEC. The performance of the generators/amplifiers subsystems, antennas selection, field amplitude and susceptibility feedback and monitoring systems is described. System control modes which guarantee the AEFGS full operability under different test conditions are discussed. Advantages of automation of susceptibility testing include increased measurement accuracy and testing cost reduction. Author (ESA)

N83-14362# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
SPECIALLY DESIGNED FARADAY CAGE FOR SPACELAB SYSTEM TESTING
H. Kraft *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 135-138 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

Two Faraday cages (1500 and 800 cu m) were developed for Spacelab tests. The first was used for the Long Module plus one Pallet and the second for the IGLOO plus three Pallet spread test configuration. Due to low-cost requirements and parallel testing constraints in the integration hall, a reuseable transportable cage with wire mesh lengths was made. The investigations and improvements of the cages with the test set ups and test results between 10kHz and 10GHz are discussed. Author (ESA)

N83-14363# European Space Research and Technology Center, Noordwijk (Netherlands).
SIMULATION OF HIGH VOLTAGE BREAKDOWN IN THE GROUND NETWORK OF THE FAINT OBJECT CAMERA c33
I. Arens *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 141-154 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

The effects of electrical breakdown at 40kV within the detector assembly of the Faint Object Camera (FOC) were studied by computer simulation using the programs ESACAP and ESAEMC. The ground network of the relevant portion of the FOC was simulated by 100 lumped elements and 56 nodes, with inductive elements representing long cables. The breakdown was simulated by either a charged capacitor or by a pulsed voltage, depending on the program. Both sources were connected with a series leakage resistor. The effects depend critically on the selected value of the leakage resistor. At 500 ohm many transients contain 3 principal frequencies of 300, 45 and 7 MHz with typical amplitudes of 1kV, 50V, and 10V respectively. At 50 ohm all transients have amplitudes on the order of several kV. Author (ESA)

N83-14364# Giessen Univ. (West Germany). Inst. of Physics.
CHARGING BEHAVIOR OF SPACECRAFT MATERIALS UNDER ELECTRON IRRADIATION
K. W. Bescherer, K. H. Groh, H. W. Loeb, and N. K. Nikolaizig *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 155-160 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

A substorm simulation facility is described, and investigations of the surface potential of Teflon, Kapton, and thermal control paints under electron irradiation are outlined. Electron irradiation up to 25KeV at a current density up to 10 nA/sqcm is possible. Current density uniformity is $> 20\%$ for a sample surface of 1sqm. Tests indicate that irradiation induces higher surface conductivity, but that bulk conductivity is relatively unchanged. No arc discharges are observed for Teflon samples thicker than 5 mil, since they reach their equilibrium potential. Author (ESA)

N83-14365*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENVIRONMENTALLY INDUCED DISCHARGES ON SATELLITES
N. John Stevens *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 161-172 refs (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

A discharge process whose trigger conditions are a negative exposed metallic surface surrounded by a less negative dielectric, and a large voltage gradient at a dielectric/metal interface is proposed. Analysis of SCATHA data for a discharge substantiates the postulation. Surface discharges cause a small transient charge transfer to space which results in voltage transients. A method of computing these transients, based on the charge lost through the capacitance to space and a fraction of charge stored in the dielectric at the discharge source was developed. It gives an estimate of the discharge transients at the discharge site, which is used as input for coupling code analysis of structure/system response. The transient computations were applied to a three-axis stabilized, geosynchronous satellite for both sunlight and eclipse charging. The energy of the transient pulses are about 1 mJ for sunlight discharge and 8 mJ for eclipse. Changing of selected coatings on the satellite would relieve the stress. Author (ESA)

N83-14366# Giessen Univ. (West Germany). Inst. of Physics.
THE POSSIBILITY OF CONTROLLING SPACECRAFT CHARGING BY MEANS OF THE ELECTRIC PROPULSION SYSTEM RIT 10
N. K. Wikolaizig, K. W. Bescherer, K. H. Groh, and H. W. Loeb

In ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 173-178 refs (For primary document see N83-14345 05-32)
(Contract ESTEC-3639/78/NL-AK)
Avail: NTIS HC A10/MF A01

The use of RIT 10 for the active control of arc discharges was studied. The influence of operating RIT 10 and/or its neutralizer on the surface potential of samples exposed to electron irradiation was assessed. The neutralizer reduces surface potential from initial values of thousands of volts to a few hundred. Results are improved by the addition of the RIT motor. Author (ESA)

N83-14367# Fondazione Ugo Bordoni, Rome (Italy).
THE MULTIPLE INPUT SINGLE OUTPUT CHANNEL CONSTITUTED BY A MULTILEVEL PULSE AMPLITUDE MODULATION (PAM) TRANSMISSION SYSTEM [IL CANALE A MOLTI INGRESSI E UNA SOLA USCITA COSTITUITO DA UN SISTEMA DI TRASMISSIONE PAM MULTILIVELLO]
Giuseppe Maria Poscetti (Rome Univ.) Dec. 1981 33 p refs In ITALIAN
(FUB-51-1981) Avail: NTIS HC A03/MF A01

A network with two inlets and one outlet is considered. Two arbitrary sources are connected to binary codifiers which provide synchronous binary messages to the multiple access chanel, which includes a four levels modulator and a transmission multiplexer. Several assumptions for the quaternary and binary decoding and for the cooperation between the two binary codifiers are studied. Transmission rates and transition probabilities are examined resulting in a clear definition of the asymptotic limits of the studied configurations. Author (ESA)

N83-14368# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DISTRIBUTED SENSOR NETWORKS Semiannual Technical Summary Report, 1 Oct. 1981 - 31 Mar. 1982
Richard T. Lacoss 31 Mar. 1982 53 p refs
(Contract F19628-80-C-0002; ARPA Order 3345)
(AD-A118868; ESD-TR-82-044) Avail: NTIS HC A04/MF A01 CSCL 17/2

The Distributed Sensor Networks (DSN) program is aimed at developing and extending target surveillance and tracking technology in systems that employ multiple spatially distributed sensors and processing resources. Such a system would be comprised of sensors, data bases, and processors distributed throughout an area and interconnected by an appropriate digital-data communication system. Surveillance and tracking of low-flying aircraft have been selected to develop and evaluate DSN concepts in the light of a specific system problem. A DSN test bed that will make use of multiple small acoustic arrays as sensors for low-flying aircraft surveillance is being developed and will be used to test and demonstrate DSN techniques and technology. GRA

N83-14369# Army Aviation Research and Development Command, St. Louis, Mo.
IMPROVED AIRBORNE HF RECEIVE ANTENNA: AN ILIR REPORT Fiscal Year, 1981
John F. Brune and John G. Gratalo Jul. 1982 46 p refs
(AD-A118861; USAAVRADCOM-TR-81-3) Avail: NTIS HC A03/MF A01 CSCL 09/5

An investigation of improvement of signal-to-noise ratio in an Airborne High Frequency Single Sideband (HF SSB) system by use of an 'active', dedicated, receive antenna function, in addition to a combination transmit/receive mode now commonly provided (shorted-loop). The approach described is an optional receive mode of the shorted-loop antenna, where electronic tuning, a stage of RF gain and a stage of matching is provided in lieu of passive tuned function normally provided by the HF SSB amp/coupler. The results obtained in this study show a possible improvement of 5 to 10 dB in the signal-to-noise ratio over the passively tuned antenna. This translates in raising an intelligibility reading of a 2 to 5. It is anticipated that this improved sensitivity can provide a doubling of the width of the 'window' in some cases. A second advantage is to permit very rapid scanning over a broad range of frequencies within a portion of the 2-30 MHz HF Band while using a 'High Q' device. The present shorted-loop design is passively tuned by cumbersome mechanically driven capacitors, thus preventing a rapid receive scan mode. Author (GRA)

N83-14370# Pennsylvania State Univ., University Park. Applied Research Lab.
EVALUATION OF CRITICAL BANDWIDTH USING DIGITALLY PROCESSED SPEECH Ph.D. Thesis
Robert D. Celmer 12 May 1982 108 p refs
(Contract N00024-79-C-6043)
(AD-A119049; ARL/PSU/TM-82-114) Avail: NTIS HC A06/MF A01 CSCL 17/2

Existing literature suggests that the hearing mechanism deals with incoming speech material by filtering the signals into a series of frequency bands. The width of these bands has been referred to as the critical band, that is, the perceptual frequency bandwidth observed in a variety of psychoacoustic contexts. Digital processing techniques have been developed for altering available recorded speech materials so that the frequency resolution available in the resultant stimuli may be controlled. Tapes have been produced wherein the frequency bandwidth resolution is limited to no better than one critical band and these tapes have been used in intelligibility testing. Some existing research indicates that the critical band is significantly widened in many individuals with sensorineural hearing loss of cochlear etiology. The digital processing routines described above were also used in developing tape recorded materials with bandwidth resolution limits considerably wider than the normal critical band The bandwidths chosen for this stage of the digital processing were based on empirical observations of the critical band of sensorineural hearing impaired patients. GRA

N83-14371# Texas A&M Univ., College Station. Dept. of Physics.
ELECTROMAGNETIC SCATTERING FROM TWO DIELECTRIC SPHERES: COMPARISON BETWEEN THEORY AND EXPERIMENT
George W. Kattawar and Cleon E. Dean 30 Aug. 1982 13 p refs Submitted for publication
(Contract N00014-80-C-0113; Grant NSF ATM-82-04191)
(AD-A119048; Rept-17) Avail: NTIS HC A02/MF A01 CSCL 20/3

A comparison is made between theoretical and experimental results for cooperative scattering between two spheres. The overall agreement between theory and experiment is quite good. Also a large side scattering resonance which was measured to be 44 times larger than that due to a single sphere was calculated to be actually 47.6 times larger. Author (GRA)

N83-14372# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif.
PLACES AIRBORNE EXPERIMENT Final Report, 1 Oct. 1980 - 1 May 1981
Roger L. Swanson, Allen L. Johnson, and James Marshall Wright-Patterson AFB, Ohio AFWAL May 1982 119 p refs
(Contract DNA001-80-C-0090; AF Proj. 1227)
(AD-A118975; AFWAL-TR-81-1250) Avail: NTIS HC A06/MF A01 CSCL 20/14

During December 1980 the Position Location and Communication Effects Simulation (PLACES) Experiment was conducted to investigate the effects of structured ionospheric plasmas on satellite communication and navigation systems. A structured plasma environment was created by a 48-kg barium release from a rocket launched from Eglin AFB Florida. The experiment was directed by the Defense Nuclear Agency and involved ten government, industry and university organizations. Measurements of propagation effects on signals from the LES 8 satellite over the Pacific to a C-135 aircraft operating in the Florida area were conducted. Measurements of the fading depth and fade rate are included in the test results. GRA

N83-14373# IIT Research Inst., Annapolis, Md.
A SIMPLIFIED METHOD FOR CALCULATING THE BOUNDS ON

THE EMISSION SPECTRA OF CHIRP RADARS Final Report
Paul D. Newhouse Aug. 1982 127 p refs Supersedes ESD-TR-70-273
(Contract F19628-80-C-0042)
(AD-A118936; ESD-TR-81-100; ESD-TR-70-273) Avail: NTIS HC A07/MF A01 CSCL 17/9

Simple equations and procedures were developed that permit rapid hand-calculation and plotting of an approximation of strong bounds on the spectra of linear frequency modulated RF pulses that have a trapezoidal envelope. The approach used in deriving the model involved the use of an asymptotic expansion instead of the usual Fresnel integrals to describe the skirts of the voltage-density spectrum. Author (GRA)

N83-14374# Stanford Univ., Calif. Electronics Labs.
ULF/ELF ELECTROMAGNETIC FIELDS PRODUCED IN SEA WATER BY LINEAR CURRENT SOURCES Technical Progress Report, 15 Aug. 1979 - 31 Jan. 1982
A. S. Inan, A. C. Fraser-Smith, and O. G. Villard, Jr. Feb. 1982 118 p refs
(Contract N00014-79-C-0848; NR Proj. 089-151)
(AD-A119341; SU-SEL-E721-1) Avail: NTIS HC A06/MF A01 CSCL 17/2

This report is concerned with the possibility of using undersea cables to communicate with undersea receivers at frequencies in the ultra low and extremely low ranges. Because of the low data transmission rate at these frequencies, communication is here understood to mean the transfer of short messages of high information content. We start by deriving theoretical expressions for the electric and magnetic fields generated in conducting medium of infinite extent by linear current sources (i.e., straight insulated current-carrying cables) of finite and semi-finite length and of finite length with gaps of either finite or infinitesimal size. GRA

N83-14375# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POLISH EXPERIMENTAL LIGHT-CONDUCTING TELETRANSMISSION SYSTEM
Zenon Szpigler 26 Jul. 1982 16 p refs Transl. into ENGLISH from Przegl. Telekomun. (Poland), v. 52, no. 11, 1979 p 337-340
(AD-A118959; FTD-ID(RS)T-0514-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

The development of light conducting teletransmission in Poland is described. Experimental speech signals which were transmitted through the experimental light conducting teletransmission cable system are discussed. GRA

N83-14376# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORY OF THE RADIATION OF SURFACE ANTENNAS
L. N. Zakharyev, A. A. Lemanskiy, and K. S. Shcheglov 2 Aug. 1982 361 p refs Transl. into ENGLISH of the mono. "Teoriya Izpucherniya Poverkhnostnykh Antenn" Moscow, 1969 p 1-231
(AD-A118960; FTD-ID(RS)T-0361-82) Avail: NTIS HC A16/MF A01 CSCL 09/5

The characteristics of antennas, located on the surface of conductive bodies are examined. Half-plane, key, circular, and elliptical cylinders are evaluated as to the effect of edges and impedance of surface and finite dimensions on the radiation pattern of a surface antenna. The results of investigation, reduced to the engineering formulas and graphs can be used for the design of antennas, which do not create aerodynamic drag, or for calculations of line source antennas and gratings of arbitrary range. GRA

N83-14377# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS OF DIFFRACTION AND PROPAGATION OF ELECTROMAGNETIC WAVES (SELECTED PAGES)
V. A. Fok 2 Aug. 1982 209 p refs Transl. into ENGLISH from Mono. "Problemy Diffraktsii i Rasprostraneniya Elektromagnitnykh Voln" Moscow, 1970 p 383-517
(AD-A118944; FTD-ID(RS)T-0597-82) Avail: NTIS HC A10/MF A01 CSCL 20/14

Topics covered include: (1) the theory of coastal refraction of electromagnetic waves; (2) some integral equations of mathematical physics; (3) a theory table of Airy's function; and (4) tables of auxiliary function used for calculating the current distribution. GRA

N83-14378# Naval Research Lab., Washington, D. C.
SOME COMPUTER PROGRAMS USEFUL IN EVALUATING SURVEILLANCE RADAR PERFORMANCE Final Report
Willis H. Harper 1 Sep. 1982 56 p refs
(S1231CC)
(AD-A119178; NRL-MR-4879) Avail: NTIS HC A05/MF A01 CSCL 17/9

Computer programs available in the Search Radar Branch at NRL applicable to evaluating surveillance radars are described. These programs represent work over the past decade. A brief description of each of the programs is given in the text with input data formats for many in the appendices. Listings and card decks reside in NRL Code 5331. Author (GRA)

N83-14379# Stevens Inst. of Tech., Hoboken, N. J. Optical Communications Lab.
THE IMPACT OF DATA RATES ON THE DESIGN OF A FIBER OPTICS GUIDANCE SYSTEM Final Report, Feb. - Jun. 1982
Gerald J. Herskowitz Jul. 1982 59 p refs
(Contract DAAG29-81-D-0100; DA Proj. 1L1-62303-A-214)
(AD-A119175; AD-E950274) Avail: NTIS HC A05/MF A01 CSCL 17/2

The data rate requirement of the optical fiber communication link for a missile guidance system has been evaluated. The data rate requirement is determined by the imaging seeker, sensors, and missile control system. The data rate limitations of the currently employed multimode optical fiber are determined for a specific signal-to-noise ratio using pulse frequency modulation. Available optical sources and detectors are evaluated, considering the effects of operating wavelength on fiber loss and dispersion characteristics. The effects of the fiber payout system on the fiber loss and dispersion characteristics are determined for both multimode and single-mode fiber. The use of optical multiplexing techniques to enhance fiber data rate is investigated. Recommendations are made for the most reliable, cost-effective approach for fiber optic missile guidance systems. Author (GRA)

N83-14380# Air Weather Service, Scott AFB, Ill.
THE PLATTEVILLE RADAR PROFILER AS A METEOROLOGICAL AND COMMUNICATIONS ENGINEERING TOOL
Gregory D. Nastrom Jan. 1982 18 p refs
(AD-A119172; AD-E850178; AWS/TN-82/003) Avail: NTIS HC A02/MF A01 CSCL 04/2

The basic operating principles and capabilities of the VHF pulsed Doppler radar located at Platteville, Colorado are discussed. Examples of horizontal and vertical wind speed measurements are presented, and the meteorological uses of these data are briefly outlined. The radar backscattered power is used to compute the refractivity turbulence structure constant. New results on the variability of the refractivity turbulence structure constant from about 5-15 km are given. Especially interesting is the large diurnal change of the constant in the upper atmosphere. GRA

N83-14381# Pennsylvania State Univ., University Park. Applied Research Lab.
DETECTION OF A DUAL CHANNEL DIFFERENTIAL PHASE MODULATED SIGNAL IN CORRELATED NOISE M.S. Thesis
Clifton C. Merchant 8 Jun. 1982 119 p refs
(Contract N00024-79-C-6043)
(AD-A119236; ARL/PSU/TM-82-136) Avail: NTIS HC A06/MF A01 CSCL 17/2

The signal detection characteristics of a two input channel receiver is studied. The signals received on both channels are random Gaussian, narrowband processes identical except for a known channel-to-channel time delay. For narrowband representation, the time delay is treated as a differential phase modulation of the two signals. The noises on each of the two receiver channels are also random Gaussian, processes which are jointly wide

sense stationary and correlated. The receiver detects the presence of a signal by estimating the average phase difference between samples of the observed signals. The performance of the signal phase matched filter receiver is compared with a cross correlation receiver which includes a noise decorrelator and signal phase compensator. The cross correlation receiver is more sensitive than the signal phase matched filter receiver if the noise correlation is known. However, if the noise correlation is unknown and the detection is made using fixed signal processing and detection threshold, the signal phase matched filter receiver gives superior performance. GRA

N83-14382# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SATNET DEVELOPMENT AND OPERATION, PLURIBUS SATELLITE IMP DEVELOPMENT, REMOTE SITE MAINTENANCE, INTERNET OPERATIONS AND MAINTENANCE, MOBILE ACCESS TERMINAL NETWORK, TCP FOR THE HP3000, TCP FOR VAK-UNIX Quarterly Technical Report, 1 May - 31 Jul. 1982
J. F. Haverty Aug. 1982 80 p
(Contracts MDA903-80-C-0353; N00039-82-C-0412; N00039-80-C-0664; N00039-81-C-0408; MDA903-80-C-0214)
(AD-A119776; BBN-5129) Avail: NTIS HC A05/MF A01 CSCL 17/2

This Quarterly Technical Report describes work on the development of and experimentation with packet broadcast by satellite; on development of Pluribus Satellite IMPs (Interface Message Provision); on a study of the technology of Remote Site Maintenance; on Internetwork monitoring; on shipboard satellite communications; and on the development of Transmission control Protocols for the HP3000 and VAX-UNIX. Author (GRA)

N83-14383# Washington Univ., St. Louis, Mo. Center for Computer Systems Design.
VLSI BASED MULTIPROCESSOR COMMUNICATIONS NETWORKS Annual Progress Report, 1 Sep. 1981 - 31 Aug. 1982
Mark A. Franklin and Donald F. Wann Sep. 1982 187 p refs
(Contract N00014-80-C-0761)
(AD-A119628) Avail: NTIS HC A09/MF A01 CSCL 09/2

An analysis of two system control methodologies, synchronous (i.e. based on the presence of a central clock) and asynchronous (i.e. self-timed, no clock is present) is presented in the context of interconnection networks (and one dimensional systolic array design). The interconnection networks of interest are oriented towards use in a multiprocessor environment. Other issues related to network design, such as pin limitations and partitioning, are considered, and an improved type of Delta network, the reinforced Delta network is defined and its properties studied. Author (GRA)

N83-14384# Naval Research Lab., Washington, D. C.
EFFECTS OF BANDWIDTH LIMITATION ON POLYPHASE CODED PULSE COMPRESSION SYSTEMS Interim Report
B. L. Lewis, F. F. Kretschmer, Jr., and F. C. Lin 2 Sep. 1982 17 p refs
(SF12131691)
(AD-A119746; NRL-8625) Avail: NTIS HC A02/MF A01 CSCL 17/9

The effects of both pre- and postcompression bandwidth limitations on frequency-derived polyphase-coded pulse compressors are illustrated. Such band limitation is found to decrease the peak to maximum range-time-sidelobe ratios of the Frank and P3 coded compressor outputs but to significantly increase the ratio using the P1, P2, and P4 codes. The band limited P1, P2, and P4 coded systems were found to produce peak to maximum sidelobe ratios close to those of so-called perfect codes such as the Barker codes without restrictions on pulse-compression ratios. Author (GRA)

N83-14385# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
MEASUREMENT OF GROUND DIELECTRIC PROPERTIES USING WIDE-ANGLE REFLECTION AND REFRACTION
Steven A. Arcone and Allan J. Delaney Mar. 1982 18 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A119596; CRREL-82-6) Avail: NTIS HC A02/MF A01 CSCL 20/14

The interpretation of continuous radar profiles requires an alternative geophysical means of obtaining ground dielectric information. Ground dielectric properties were measured using wide-angle reflection and refraction (WARR) soundings with a ground-probing radar set that transmits pulses f a few nanoseconds duration. The investigations, carried out over sandy gravel in interior Alaska, provided dielectric data to about a 5-m depth. The WARR soundings were displayed as individual traces allowing interference between separate events and dispersion to be observed, and the soundings were compared with continuous radar and resistivity profiles conducted concurrently to extract the maximum amount of dielectric information. The dielectric constants, derived mainly from the direct ground waves propagating along the surface, ranged from 2.9 to 7.4. Dielectric values interpreted for one site predicted the possibility of a refracted event which may have occurred during one of the soundings. Author (GRA)

N83-14386# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
NONLINEAR BERNSTEIN-GREENE-KRUSKAL WAVE EQUILIBRIA SUBJECT TO GLOBAL ENERGY AND MOMENTUM CONSERVATION CONSTRAINTS
Ronald C. Davidson and Kang T. Tsang Sep. 1982 35 p refs
(Contract N00014-79-C-0555)
(AD-A119567; SAI-254-82-243-LJ; PRI-49) Avail: NTIS HC A03/MF A01 CSCL 20/14

The class of Bernstein-Greene-Kruskal (BGK) solutions to the nonlinear Vlasov-Poisson equations are examined within the context of the conservation of (spatially averaged) number, momentum and total energy, imposed as ancillary global constraints that connect the final saturated BGK state to a specified initial distribution function f(x,v,O). While imposing three conservation constraints of course does not uniquely determine the final BGK state, it does not remove a large degree of ambiguity as to whether particular classes of solutions are accessible from given initial conditions. It also permits a determination of important features of the final BGK state (e.g., saturation amplitude, wave phase velocity, etc.) in terms of properties of the initial distribution functions. GRA

N83-14387# Army Avionics Research and Development Activity, Fort Monmouth, N. J.
ELECTRONIC VOICE COMMUNICATIONS IMPROVEMENTS FOR ARMY AIRCRAFT
Mitchell S. Mayer Aug. 1982 21 p refs
(AD-A119427; USAAVRADCOM-TR-81-E-1) Avail: NTIS HC A02/MF A01 CSCL 17/2

The communications systems on all Army aircraft flying today are based on design concepts that are over 50-years old. We have designed a totally modern, state-of-the-art communications system for Army aircraft, and have published two new specifications which contain many of the modern test procedures required to accurately test and evaluate the various components of the communication system. As a first step in the development of new test procedures, we evaluated both ASA and ANSI standards and found them lacking. The components of the new state-of-the-art communications system will include, as a minimum: high impedance DC powered noise canceling microphones (using piezoelectric ceramic, electret, or PVF2 diaphragms); earphone elements designed and tested to have flat frequency response when inside the circumaural earcup of the hearing protective device; and intercoms which replace positive peak-clipping with fast-acting AGC circuits and expander/compander circuits for maximum output signal without distortion, even under conditions of extremes stress. In the future, audio signals in the microphone will be converted into the digital mode or directly into the optical spectrum for high efficiency, and secure communications inside the aircraft. The savings in weight and security improvements will be considerable. GRA

N83-14388# Naval Postgraduate School, Monterey, Calif.
ATMOSPHERIC EFFECTS ON ULTRA HIGH FREQUENCY RADIO PROPAGATION M.S. Thesis
Joseph Clent Boudreaux, III Jun. 1982 88 p refs
(AD-A119581) Avail: NTIS HC A05/MF A01 CSCL 20/14

The dependence of received power on range within and below atmospheric ducts was measured in conditions of elevated, nonhomogeneous, multilayered ducts. An aircraft with UHF transmitter covered the range 0 to 150 nm. from a shore based receiver. Range dependent maxima and minima in received power were detected at the surface in elevated duct conditions. The results were compared to predictions from ray, waveguide multi-mode, and single mode theories. Ray and single mode theories were inadequate to predict power patterns over the horizon. Multi-mode theory yielded qualitative agreement for conditions of deep, low elevated ducts. Agreement for higher, thinner, ducts was poor. Multilayered duct systems were observed and produced interference patterns without recognizable period with range. Author (GRA)

N83-14389# Haskins Labs., New Haven, Conn.
SPEECH RESEARCH Progress Report, 1 Apr. - 30 Jun. 1982
1982 312 p refs
(Contract PHS-N01-HD-1-2420; Grants PHS-HD-01994; PHS-HD-16591; PHS-RR-05596; PHS-NS13870; PHS-NS13617; PHS-NS18010; NSF PRF-80-06144; NSF BNS-81-11470)
(AD-A119426; SR-70(1982)) Avail: NTIS HC A14/MF A01 CSCL 06/16

Several articles addressing topics in speech research are presented. The topics include: exploring the functional significance of physiological tremor: A biospectroscopic approach; differences between experienced and inexperienced listeners to deaf speech; a language-oriented view of reading and its disabilities; Phonetic factors in letter detection; categorical perception; Short-term recall by deaf signers of American sign language; a common basis for auditory sensory storage in perception and immediate memory; phonological awareness and verbal short-term memory; initiation versus execution time during manual and oral counting by stutterers; trading relations in the perception of speech by five-year-old children; the role of the strap muscles in pitch lowering; phonetic validation of distinctive features; consonants and syllable boundaires; and vowel information in postvocalic frictions. M.G.

N83-14390# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
MULTI-ACCESS IN PACKET RADIO NETWORKS M.S. Thesis
Erdal Arikan Sep. 1982 75 p refs
(Contract N00014-75-C-1183)
(AD-A119423; LIDS-TH-1234) Avail: NTIS HC A04/MF A01 CSCL 17/2

A PRN (packet radio network) is a collection of geographically distributed, possibly mobile users where each user is capable of transmitting and receiving messages over a shared broadcast medium. In a PRN, messages are divided into packets, which may be fixed or variable in length, and each packet is transmitted through the network individually. Packets are assembled at their destinations to reconstruct the original messages. The data traffic in a PRN is characterized by specifying the average message arrival rates to the network for each o-d (origin-destination) pair. A set of o-d rates is called feasible if there exist network protocols under which the number of packets in the network still not delivered to their destinations remains finite with probability one. The capacity region of a PRN is defined to be the set of all feasible sets of o-d rates. In this thesis, PRNs are studied from the viewpoint of feasibility, i.e., we take an arbitrary set of message input rates as given and try to determine if it is feasible. Our main conclusion is that, unless P = NP, there exists no practical algorithm for characterizing the capacity region of a PRN, in the sense that the decision problem regarding the feasibility of a given set of o-d rates is NP-complete. Author (GRA)

N83-14391# Stanford Univ., Calif. Dept. of Computer Science.
WAVE PROPAGATION AND STABILITY FOR FINITE DIFFERENCE SCHEMES Ph.D. Thesis
Lloyd Nicholas Trefethen May 1982 106 p refs
(Contract N00014-75-C-1132)
(AD-A119418; SU-STAN-CS-82-905) Avail: NTIS HC A06/MF A01 CSCL 12/1

This dissertation investigates the behavior of finite difference models of linear hyperbolic partial differential equations. Whereas a hyperbolic equation is nondispersive and nondissipative, difference models are invariably dispersive, and often dissipative too. We set about analyzing them by means of existing techniques from the theory of dispersive wave propagation, making extensive use in particular of the concept of group velocity, the velocity at which energy propagates. The first three chapters present a general analysis of wave propagation in difference models. We describe systematically the effects of dispersion on numerical errors, for both smooth and parasitic waves. The reflection and transmission of waves at boundaries and interfaces are then studied at length. The key point for this is a distinction introduced here between leftgoing and rightgoing signals, which is based not on the characteristics of the original equation, but on the group velocities of the numerical model. The last three chapters examine stability for finite difference models of initial boundary value problems. GRA

N83-14392# Los Alamos Scientific Lab., N. Mex.
RADIO-FREQUENCY HEATING PLANS FOR CTX
S. O. Knox and B. L. Wright 1981 5 p refs Presented at the 4th Ann. Compact Toroid Symp., Livermore, Calif., 27-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002337; LA-UR-81-3187; CONF-811087-2) Avail: NTIS HC A02/MF A01

Electron thermal conduction and residual impurity radiation causes substantial cooling of the plasma toroid by the time it has formed inside the flux conserver. Auxiliary heating of the stable structure is needed. If an energy of several hundred joules is to be supplied over a hundred microsecond time scale, several megawatts of power are required. Such levels can be achieved from pulsed rf sources at frequencies in the ion cyclotron range and below (0.1 to 10 MHz). GRA

N83-14393# Los Alamos Scientific Lab., N. Mex.
RACETRACK MICROTRON RADIO-FREQUENCY SYSTEM
P. J. Tallerico and A. K. Mitra 1981 4 p refs Presented at the 1981 Linear Accelerator Conf., Santa Fe, N. Mex., 19-21 Oct. 1981
(Contract W-7405-eng-36)
(DE82-004341; LA-UR-81-3059; CONF-811083-12) Avail: NTIS HC A02/MF A01

The design and construction progress of a prototype rf system to drive the Los Alamos-NBS racetrack microtron (RTM) electron accelerator is described. The rf system requires 450-kW cw at 2380 MHz from a single klystron. The output from the klystron is split three ways to drive a section, a preaccelerator section, and the main accelerator section. The fields in each section are phase and amplitude controlled to tight tolerances. Temperature control of the accelerator sections is linked to the amplitude control system, because the system's average power is so high. GRA

N83-14394# Fondazione Ugo Bordoni, Rome (Italy).
IMPLEMENTATION OF A 4DCFSK NUMERICAL CHANNEL AT 34 MBIT/SEC: ANALYTIC STUDY AND DETERMINATION OF THE SPECIFICATIONS OF THE MAIN BASE BAND COMPONENTS AND OF THE INTERFACE BETWEEN NUMERICAL CHANNELS AND THE FDM-FM RADIO LINK [REALIZZAZIONE DI UN CANALE NUMERICO 4DCFSK A 34 MBIT/SEC: STUDIO ANALITICO E DETERMINAZIONE DELLE SEPCIFICHE DEI PRINCIPALI APPARATI DI BANDA BASE E DI INTERFACCIA TRA CANALE NUMERICO E PONTE RADIO FDM-FM]
Dario DiZenobio and Paolo Mandarini (Rome Univ.) Dec. 1981 42 p refs In ITALIAN
(FUB-49-1981) Avail: NTIS HC A03/MF A01

The feasibility of implementing terminal equipment in order to

adapt an analog radio link in the 6 GHz band to the transmission of a 34 Mbit PCM digital signal is analyzed. The multilevel line coding and the correct segmentation of the received line sequence are studied in particular. A detailed block diagram of the components is described, demonstrating the feasibility of each block, and indicating the integrated circuit families best adapted to each case. Author (ESA)

N83-14395# Fondazione Ugo Bordoni, Rome (Italy).
ANALYSIS OF CROSS-POLARIZATION DATA FOR TWO KINDS OF POLARIZATION [ANALISI DATI DI CROSS-POLARIZZAZIONE A DUE DIVERSE POLARIZZAZIONI]
Dario Maggiori, Pier Giorgio Migliorini, and Aldo Paraboni (Politec. di Milano) Dec. 1981 19 p refs In ITALIAN
(FUB-52-1981) Avail: NTIS HC A02/MF A01

The experimental results of radioelectric measurements at 18 GHz with linear polarization are analyzed to check a depolarization measuring technique and to investigate the principal planes characteristics and anisotropy of rain induced depolarization. A linearly polarized signal forming an angle of 17 deg with the vertical is transmitted. Rain intensity data are simultaneously collected. The radioelectric signal is processed to obtain information about the mean effective canting angle. The algorithm which is utilized is described. It is shown that linear depolarization measurements made in a vertical plane are not effective to obtain an estimation of the canting angle. The tilting of 17 deg makes the measurement possible, even if statistical treatment of data is still necessary. An average canting of 3 to 4 deg characterizes the process. Author (ESA)

N83-14396# Fondazione Ugo Bordoni, Rome (Italy).
LINEAR PREDICTIVE CODING ANALYSIS OF THE VOICE SIGNAL WITH CONTINUOUS SHIFTING WINDOWS OBTAINED WITH AN ITERATIVE COMPUTING METHOD [ANALISI LPC DEL SEGNALE VOCALE CON FINESTRE A SPOSTAMENTO CONTINUO OTTENUTE CON UN METODO DI CALCOLO ITERATIVO]
Foster Bianchi, Paolo Pocci, and Lucio Prina Ricotti Dec. 1981 26 p In ITALIAN
(FUB-53-1981) Avail: NTIS HC A03/MF A01

An algorithm to compute the autocorrelation coefficients of voice signals, which are used in an iterative way is defined. A linear prediction procedure which utilizes the autocorrelation coefficients for the continuous analysis of the voice signal is presented. An approximation of the voice signal power spectrum, based on one or two poles exponential filters is used to determine the formats of the signal. An experiment was performed using a PDP 11/34 computer and available test signals. As expected, all components of the test signal corresponded to one pole of the approximation spectrum located in the proximity of the unit circle. Author (ESA)

N83-14860*# Baker (James L.) Development Corp., Sherwood Forest, Md.
DISTRESS COMMUNICATION AND LOCATION SYSTEM FOR SMALL CRAFT
James L. Baker *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 76-77 refs (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 17B

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N83-14397*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH SPEED COMPUTERIZED DATA ACQUISITION OF PHOTOVOLTAIC V-1 CHARACTERISTICS Final Report
Richard DeLombard and Ronald C. Cull Nov. 1982 23 p
(Contract DE-AI01-79ET-20485)
(NASA-TM-82967; E-1387; NAS 1.15:82967;
DOE/NASA-20485-12) Avail: NTIS HC A02/MF A01 CSCL 09C

The voltage current (5-1) characteristics of the photovoltaic array were studied under actual environmental conditions. A method of data acquisition was devised that uses a capacitor charge technique to obtain the 5-1 characteristic and a computerized data system to display, record and process the data. The capacitor charge technique uses an array shorting transistor and a capacitor bank to sweep the array operating voltage and current from short circuit to open circuit in a specified time (approximately 125 ms). The computerized data system is synchronized with this transition and repetitively samples the array voltage and current during the transition and records the ambient conditions. This data is then normalized by the computer to standard conditions (100 mW/sq cm, 28 C) and is available in tabular and graphic form for both the voltage current and voltage power characteristics. The capacitor charge technique is described. S.L.

N83-14398*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
AN IMPROVED SWITCHING CONVERTER MODEL Ph.D. Thesis. Final Report
Daniel Jeffrey Shortt Nov. 1982 286 p refs
(Grant NsG-3274)
(NASA-CR-169669; NAS 1.26:169669) Avail: NTIS HC A18/MF A01 CSCL 09C

The nonlinear modeling and analysis of dc-dc converters in the continuous mode and discontinuous mode was done by averaging and discrete sampling techniques. A model was developed by combining these two techniques. This model, the discrete average model, accurately predicts the envelope of the output voltage and is easy to implement in circuit and state variable forms. The proposed model is shown to be dependent on the type of duty cycle control. The proper selection of the power stage model, between average and discrete average, is largely a function of the error processor in the feedback loop. The accuracy of the measurement data taken by a conventional technique is affected by the conditions at which the data is collected. S.L.

N83-14399*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN OF A MULTISTAGE DEPRESSED COLLECTOR FOR THE F-16 RADAR DUAL MODE TRANSMITTER TUBE
James A. Dayton, Jr. Nov. 1982 18 p refs
(NASA-TM-82982; E-1413; NAS 1.15:82982) Avail: NTIS HC A02/MF A01 CSCL 09C

The design of a multistage depressed collector (MDC) for use with the F-16 radar dual mode transmitter tube is described. The methods employed and the rationale on which the design is based are presented. E.A.K.

N83-14400# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary Report, 1 Nov. 1981 - 31 Jan. 1982
Alan J. McLaughlin and Alan L. McWhorter 15 Feb. 1982 26 p
(Contract F19628-80-C-0002; AF Proj. 649L)
(AD-A118869; ESD-TR-82-009) Avail: NTIS HC A03/MF A01 CSCL 09/5

Progress in specific areas electronic technology is reported. Topic include: restructurable VLSI technology: semiconductor processing; device theory; solid state device research; quantum electronics; materials research; microelectronics; analog device technology; and computer systems. M.G.

N83-14401# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Advanced Technology Labs.
MNOS/SOS RADIATION HARDNESS PERFORMANCE AND RELIABILITY STUDY Interim Report, Aug. 1979 - Aug. 1980
F. L. Hampton and J. R. Cricchi Griffiss AFB, N.Y. RADC May 1982 165 p refs
(Contract F19628-79-C-0133)
(AD-A118864; RADC-TR-82-89) Avail: NTIS HC A08/MF A01 CSCL 09/5

In this investigation the endurance-retention characteristics of fast-write MNOS memory structure, and radiation tolerance of metal-gate dual-dielectric and polysilicon-gate all-oxide devices have been evaluated. Writing and clearing speed have been studied with respect to the NH3:SiH4 ratio (APCVD), and NH3: SiC12H2 ratio (LPCVD). The films deposited with a low NH3:SiC12 ratios could be written and cleared with shorter pulse widths; however, a degradation in retention was observed. An improvement in the endurance retention product of a drain source protected transistor structure has been realized by oxidizing the memory nitride followed by an H2 anneal immediately after deposition. The film was deposited with a LPCVD reactor at 750 deg with a NH3:SiC12H2 ratio of 9:1. Oxidation was performed in steam at 900 C, as was the subsequent H2 anneal. The effect of total dose radiation was found to be more severe for a positive bias. The all oxide polysilicon gate transistor structures were observed to be relatively soft, however results from capacitor structures shows promise in developing a radiation tolerant polysilicon-gate all-oxide gate structure. Author (GRA)

N83-14402# Harry Diamond Labs., Adelphi, Md.
CALCULATIONS OF SECOND BREAKDOWN IN SILICON DIODES
Alford L. Ward Aug. 1982 128 p refs
(DA Proj. 1L1-62120-AH-78)
(AD-A119296; HDL-TR-1978) Avail: NTIS HC A07/MF A01 CSCL 09/1

An electrothermal model computer program is described and used to study the basic physical mechanisms that initiate second breakdown. It is shown that space charge in the reverse-biased diode causes a negative resistance to develop, which in turn leads to filamentation and damage. Various doping profiles are studied. Thermal injection currents are shown to be important for time greater than the thermal time constant. High forward currents and reverse switching into avalanche are calculated. The effects of ionizing radiation are presented. The analogy of the stages of second breakdown with glow and arc discharges in gases is found to be useful. Author (GRA)

N83-14403# Harry Diamond Labs., Adelphi, Md.
ELECTRONIC AND MICROELECTRONIC CAPABILITIES
Rhoda H. Kight and Dennis W. Martin Jul. 1982 59 p refs
(AD-A119272; HDL-SR-82-5) Avail: NTIS HC A04/MF A01 CSCL 09/1

This brochure outlines the organizational structure and describes the fabrication and support capabilities of the Electronic Engineering Technology Branch of Harry Diamond Laboratories. This branch consists of five primary groups - Computer-Aided Operations (CAO), PC Board Facility; Thick Film Facility; Assembly/ Model Shop, and Component Testing. The major equipment pieces associated with each group are described and illustrated to define the range of capabilities of this branch. The descriptions reveal both capability and function. Author (GRA)

N83-14404# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DEVICE FOR ADJUSTING THE GAIN FACTOR OF AUTOMATIC CONTROL SYSTEMS
B. V. Novoselov, A. V. Biryukov, and V. M. Vinnichenko 10 Aug. 1982 10 p Transl. into ENGLISH of Russian Patent no. 328428 (2 Feb. 1972) p 1-4
(AD-A118943; FTD-ID(RS)T-1026-82) Avail: NTIS HC A02/MF A01 CSCL 09/3

This device is used to create automatic tuners for automatic control systems, and, with certain modifications, self-tuning systems. This device includes a circuit for isolating the phase of the reference signal, a test signal sensor connected to its input, and two relays whose windings are connected to the outputs of the circuits for isolating the phase of the reference signal and the error signal, respectively. Their outputs are connected to the shaper, which is connected to the servomotor. The test signal sensor is equipped with a rotating transformer which is connected to the motor through a reducer. Here the rotor winding of the rotating transformer is connected to the input of the device, while one of its ends is also connected to the output of the sensor. GRA

N83-14405# Naval Postgraduate School, Monterey, Calif.
IMPACT OF VHSIC TECHNOLOGY ON BATTLE ZONE MATERIAL MANAGEMENT M.S. Thesis
Thomas Hewitt Hicks Jun. 1982 97 p refs
(AD-A119766) Avail: NTIS HC A05/MF A01 CSCL 09/5

A new era in military microelectronics is unfolding. The Department of Defense, in 1979, initiated a six-year tri-service Very High Speed Integrated Circuits (VHSIC) Program that will develop a new technology base for integrated circuits. This program has the potential of producing systems-on-a-chip capability. VHSIC, with its high density circuits, promises drastic reductions in size, weight, and power requirements, while still yielding higher levels of reliability and performance. Author (GRA)

N83-14406# B-K Dynamics, Inc., Rockville, Md.
GYROTRON GUN STUDY REPORT
J. Mark Baird and Anthony C. Attard 18 Sep. 1982 112 p
(Contract N00173-79-C-0132)
(AD-A119707; TR-3-476) Avail: NTIS HC A06/MF A01 CSCL 09/1

The purpose of the program was to explore new gyrotron gun configurations and to design a low velocity spread replacement gun for the NRL 35 GHz gyro-TWT. The specific beam forming techniques which were studied were magnetic field reversal, transverse magnetic field kicker, and single anode (diode-like) Magnetron Injection Guns (MIGs). This report contains a summary of our work in each of these areas as well as a description of the new MIG design for the gyro-TWT. Gyrotron oscillators and amplifiers require an entirely different type of electron gun design than those normally used in conventional tube designs. The ideal beam must not only have the proper geometry to maximize the rf interaction with the selected waveguide circuit mode, but also, for maximum efficiency, there are two additional requirements: (1) the transverse velocity of the electrons must exceed the longitudinal velocity by a typical factor of 1.5 to 2 (intermixed helical electron trajectories are allowed); and (2) the spread in the longitudinal velocities must be small (on the order of 10-20% for oscillators, 2-5% for amplifiers). Several methods for producing gyrotron beams have been investigated, and most likely different approaches will be necessary for differing power levels and velocity spread requirements. GRA

N83-14407# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
RESISTANCE RISE IN ULTRATHIN METALLIC WIRES AT LOW TEMPERATURES Interim Report
Alice E. White Aug. 1982 167 p refs Sponsored in part by the Air Force, DARPA, and Bell Labs.
(Contract N00014-77-C-0085; Grants NSF DMR-80-20247; NSF DMR-79-04155; NR Proj. 319-116)
(AD-A119594; TR-18) Avail: NTIS HC A08/MF A01 CSCL 11/6

The wires, which have cross-sectional dimensions as small as 220A x 200A, are fabricated using a versatile step-edge shadowing technique. The dimensions of the wires can be precisely determined by easily-controlled fabrication parameters such as thin film thickness and shadowing angle. In order to verify the dimensions and integrity of the wires, we have developed a convenient and reliable technique for thinning the substrate. This allows nondestructive examination of the structures by high resolution transmis-

sion electron microscopy. We have used a similar technique to investigate grain sizes of thin metal films. The theoretical models for the low temperatures resistance rise in samples of reduced dimensionality are usually classed as based on one-electron localization or many-electron interaction effects. Our experimental results for copper, AuPd alloy, and nickel wires accurately confirm the proportionality to T to the -1/2 predicted by the interaction model of Altshuler, Khmelnitzkii, Larkin, and Lee. Moreover, we find that our results and the results of a careful reanalysis of the data already in the published literature give an absolute magnitude consistent within a factor of approx. 2 with the quantitative predictions of this model, using independently determined parameters. We therefore infer that interaction effects are at least as important as, and may dominate over, localization effects in all one dimensional lithographically-produced samples reported to date. GRA

N83-14408# General Electric Co., Binghamton, N.Y. Armament and Electrical Systems Dept.

LIQUID COOLED VARIABLE SPEED CONSTANT FREQUENCY (VSCF) CONVERTER DEVICE DEVELOPMENT Final Report, Sep. 1978 - Dec. 1981

John W. Butler Wright-Patterson AFB, Ohio AFWAL Jun. 1982 160 p refs

(Contract F33615-78-C-2029; AF Proj. 3145)

(AD-A119424; AES-13589; AFWAL-TR-82-2048) Avail: NTIS HC A08/MF A01 CSCL 20/12

Further miniaturization of high-power semi-conductor devices utilizing silicon disks larger than 12 mm. requires major innovations to improve the average thermal impedance and surge capability. The high thermal impedance in existing discrete devices is caused mostly by the dry interfaces necessary to provide stress relief. This report presents a unique approach to solving the dry interface problem. It describes the design, fabrication and evaluation of a smaller, lighter, electrically isolated dual thyristor module featuring structured copper, solder bonding, polyimide passivation, direct bonded copper on beryllium oxide and a hermetic sealed aluminum case. Details of the SCR modules evaluation in a 60 KVA single channel VSCF electrical generating system are included.

Author (GRA)

N83-14409# Sandia Labs., Albuquerque, N. Mex.

PULSED POWER SWITCHING USING SATURABLE CORE INDUCTORS

M. Stockton, E. L. Neau, and J. P. VanDevender 1981 9 p refs Presented at the 27th Ann. Conf. on Magnetism and Magnetic Mater., Atlanta, Ga., 10 Nov. 1981

(Contract DE-AC04-76DP-00789)

(DE82-000259; SAND-81-2144C; CONF-811123-1) Avail: NTIS HC A02/MF A01

The problems involved in switching fast, high power pulses using single turn saturable core inductors constructed of Metglas 2605SC were investigated. These include hold-off voltages and times, output pulse risetimes, B-H curves of the material under fast pulse conditions, and propagation of the saturation field through the core. Experiments were done on the RAMSES I accelerator which uses a 200 kV Marx generator to provide a 200 ns pulse to a 1 omega coaxial water transmission line. GRA

N83-14410# Lincoln Lab., Mass. Inst. of Tech., Lexington.

USING MEASUREMENTS TO DETECT ELECTRICAL PROBLEMS IN OPERATIONAL PHOTOVOLTAIC ARRAYS

S. E. Forman 1981 8 p refs Presented at the Com. Photovoltaics Meas. Workshop, Vail, Colo., 27-29 Jul. 1981

(Contract DE-AC02-76ET-20279)

(DE82-002308; DOE/ET-20279/149; CONF-810748-4) Avail: NTIS HC A02/MF A01

The US Department of Energy has set a 20-year lifetime goal for terrestrial photovoltaic modules. In its capacity as a Photovoltaic Field Tests and Applications Center, Massachusetts Institute of Technology Lincoln Laboratory has established various experimental test sites throughout the United States from 1.5 to 100 kW of peak power. These sites contain modules from several manufactures and serve as test beds for photovoltaic system components. From May 1977 to date, over 11,000 modules have been placed in service at these sites, of which a total of 320 have suffered electrical failures. The methods used to detect failures in operational photovoltaic power-generating systems are reported for several Lincoln Laboratory test sites. DOE

N83-14411# Oak Ridge National Lab., Tenn.

HEATED-LENGTH DEPENDENCE OF THE STABILITY OF AN INTERNALLY COOLED SUPERCONDUCTOR

J. W. Lue and J. R. Miller 1981 4 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26 Oct. 1981

(Contract W-7405-eng-26)

(DE82-002920; CONF-811040-100) Avail: NTIS HC A02/MF A01

The recovery of an internally cooled superconductor (ICS) depends strongly on the transient flow induced by the heat previously transferred to helium inside the conduit. A longer heated length induces a higher transient flow and a larger heat transfer than a shorter one. Thus, an ICS actually is more stable when the heated section is longer. For very short heated lengths, the end conduction from the normal front may play an important role in the recovery of the superconductor; therefore, high stability margins exist for very short heated lengths also. A 5 m long, single triplex, NbTi ICS was made with a heater imbedded along the whole length. Taps on the heater are brought out at various positions to allow as short as 50 cm lengths of the conductor to be heated. Stability margins as a function of the heated length are measured and compared with a semiquantitative theory. GRA

N83-14412# Edgerton, Germeshausen and Grier, Inc., San Ramon, Calif.

NEW HIGH SPATIAL RESOLUTION ELECTRONICS STREAK TUBE

C. K. Hinrichs and R. M. Estrella 1981 6 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21 Oct. 1981

(Contract DE-AC08-76NV-01183)

(DE82-001783; EGG-1183-4224; CONF-811012-6) Avail: NTIS HC A02/MF A01

A high-resolution, electrostatically focused streak tube is being developed as a major component for a streak camera system. The design goals for the tube include a time resolution of 100 ps and 500 line pairs of spatial resolution across the 1-in. photocathode. This would provide about twice the total number of resolution elements presently available in existing tubes. Sophisticated computer programs were used in the design of the tube to trace electron trajectories in the two dimensional, azimuthally symmetric electric fields. Both tangential and sagital trajectories were considered, so that the tangential and sagital focal surfaces can be designed to be in proximity to each other, thus affording better spatial resolution. DOE

N83-14413# Sandia Labs., Albuquerque, N. Mex.

COMPOUND SEMICONDUCTORS FOR HIGH-TEMPERATURE ELECTRONIC APPLICATIONS

T. E. Zipperian and R. J. Chaffin 1981 27 p refs Presented at the IEEE High Temperature Electron. and Instrumentation Conf., Houston, 7 Dec. 1981

(DE82-004137; SAND-81-2535C; CONF-811213-1) Avail: NTIS HC A03/MF A01

Compound semiconductor technology as it relates to high temperature electronic device applications is reviewed. The electrical requirements of majority and minority carrier device types are examined and six compound semiconductor materials are presented which are capable of operation above 300 C. The state of the technological development of each of these materials is reviewed, and several potential application areas of compound semiconductors are suggested. The high temperature characteristics of devices fabricated in four of these chemical systems are displayed. GRA

N83-14414# Los Alamos Scientific Lab., N. Mex.

THE 30-MJ SUPERCONDUCTING MAGNETIC ENERGY STOR-

AGE FOR BPA TRANSMISSION-LINE STABILIZER
R. I. Schermer 1981 20 p refs Presented at US-Japan Superconductive Magnetic Energy Storage Workshop, Madison, Wis., 19 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002355; LA-UR-81-3040; CONF-811051-2) Avail: NTIS HC A02/MF A01

The development of a 30 MJ (8.4 kWh) suprconducting magnetic energy storage (SMES) unit with a 10 MW converter which can provide system damping for low frequency oscillations is described. The coil is complete and all major components of the electrical and cryogenic systems were received and are tested. Computer control hardware is in place and software development is proceeding. Support system components and dewar lid are fabricated and foundation design is complete. DOE

N83-14415# California Univ., Livermore. Lawrence Livermore Lab.
ELIMINATION OF OUTPUT-CURRENT TRANSIENTS IN THE MFTF SUSTAINING NEUTRAL-BEAM-ARC POWER SUPPLIES
H. W. VanNess, D. J. Mayhall, and J. H. Wilson 20 Oct. 1981 4 p ref Presented at the 9th Symp. on Engr. Prcbl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-002068; UCRL-86073; CONF-811040-38) Avail: NTIS HC A02/MF A01

The twenty-three MFTF sustaining neutral beam arc power supplies were designed to provide 0.3 to 30 second output pulses over a range of 24 to 71 volts and 600 to 4000 amperes at 10 percent duty. For economic reasons, the circuit design consists of a 12 pulse rectifier which is synchronously switched on and off by a three phase electromechanical contactor in the primary ac input. Analysis of the problem, various possible solution considered, and the simple and inexpensive solution adopted for use are described. DOE

N83-14416# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
DEVELOPMENT AND CONSTRUCTION OF A PILOT PROCESSOR FOR ELECTRON CURING Final Report, Dec. 1980
Michael Reichle Bonn Bundesministerium fuer Forschung und Technologie Jul. 1982 41 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-126; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9

A specially adapted electron processor was developed to cure printing inks of a high speed printing machine. The electron processor is characterized by a high electron beam intensity (1 mA for 1 cm paper width) and a low acceleration voltage (100 kV). A ribbon-like thin film field emission cathode (cold cathode) is first used as a powerful electron gun. Because of the generation of an electron curtain consisting of discrete electron beams, there is no need for a complicated beam scanning unit. The electron beams are focused by a simple aperture lens mask and pass the beam window at fixed points. A window with very low beam losses is feasible. Author (ESA)

N83-14417# Research Inst. of National Defence, Linkoeping (Sweden).
SENSITIVITY OF IFM AND CRYSTAL VIDEO RECEIVERS WITH PREAMPLIFICATION [KAENSLIGHET HOS IFM- OCH KRISTALLVIDEOMOTTAGARE MED FOERFOERSTAERKNING]
Hans Bergdal Feb. 1982 36 p refs In SWEDISH Original contains color illustrations
(FOA-C-30263-E4) Avail: NTIS HC A03/MF A01

A method for sensitivity determination of a receiver consisting of a broadband amplifier, a square law detector, and a video amplifier is described. The necessary signal to noise ratio ahead of the detector is calculated according to the desired values for the detection probability, false alarm hazard, and the broadband ratios ahead and after the detector. The sensitivity is determined in the usual way using values for losses, noise factor, and bandwidth ahead of the detector. The corresponding graphs are presented. The necessary amplification before detection is discussed and the combined sensitivity for antenna and receiver together is indicated in dBm/mcsq and dBmi. Author (ESA)

N83-14418# Research Inst. of National Defence, Linkoeping (Sweden).
REPORT ON INTENSIFIED RESEARCH EFFORTS MADE ON RADIATION SUSCEPTIBILITY OF LARGE SCALE INTEGRATED SEMICONDUCTOR CIRCUITS [UTREDNING ANGAAENDE INTENSIFIERADE FORSKNINGSINSATSER ROERANDE HOEGINTEGRERADE HALVLEDARKRETSARS STRAALNINGSKAENSLIGHET]
L. Hagstroem, B. Skarstam, O. Lagerstedt, and S. Risberg Feb. 1982 28 p refs In SWEDISH
(FOA-C-30267-E3) Avail: NTIS HC A03/MF A01

Semiconductor susceptibility in radiation environments such as neutron irradiation or ionizing radiation is discussed. Technical improvments in the manufacturing of various semiconductors and the state of the art hardness levels in digital IC technologies are summarized. Hardening techniques are mentioned. A research management program is developed; the hardening of CMOS circuits is considered as a very important research item. Author (ESA)

N83-14419# Research Inst. of National Defence, Linkoeping (Sweden).
DIFFERENT MEASUREMENTS WITH A SAW CONVOLVER AND DESCRIPTION OF A CODE GENERATOR (PRBS) GENERATOR [NAAGRA OLIKA MAETNINGAR PAA EN SAW-CONVOLVER OCH BESKRIVNING AV EN KODGENERATOR]
Olle Gaellstedt, Ulf Ringoe, and Rickard Wallden Mar. 1982 52 p refs In SWEDISH
(FOA-C-30268-E4) Avail: NTIS HC A04/MF A01

Measurements with a surface acoustic wave piezoelectric monolithic convolver, which allows the correlation of codes up to 1000 or more chips in length at chip rates from a few MHz to over 100 MHz with essentially instantaneous programmability are described. Most of the measurements were made using a pseudo random binary sequence (PRBS) code generator which can produce two maximum length codes, the one opposite-in-time to the other. Operating instructions and a literature survey are given.
Author (ESA)

N83-14420# Research Inst. of National Defence, Linkoeping (Sweden).
CALIBRATION PROCEDURE FOR MEASUREMENT OF SCATTERING PARAMETERS IN A SEMI-AUTOMATIC NETWORK ANALYSIS [KALIBRERINGSRUTINER VID UPPMAETNING AV S-PARAMETRAR PAA SEMI-AUTOMATISK NAETVERKSANALYSATOR]
Manfred Marchner Mar. 1982 117 p refs In SWEDISH
(FOA-C-30280-E) Avail: NTIS HC A06/MF A01

Methods for correcting errors in scattering parameter measurements on microwave sets due to the measuring system shortcomings are reviewed. A 6-term routine was carried out on a modified Hewlett-Packard 8409 A-system and compared to the implemented 4-term model. The 6-term model shows better test results than the 4-term model when measuring the transmission factor of a component with a high signal transmission level. For low levels, the 6-term model is more sensitive but no noticeable differences are found. Calibrating with the 6-term model is time consuming.
Author (ESA)

N83-14421# Fondazione Ugo Bordoni, Rome (Italy).
EXTENSION OF A JITTER COMPUTING METHOD WHICH UTILIZES THE POWER AND PHASE SPECTRA TO A SEQUENCE OF REPEATERS [ESTENSIONE DEL METODO DI CALCOLO DEL JITTER CON GLI SPETTRI DI POTENZA E DI FASE AL CASO DI UNA CATENA DI RIPETITORI]
Giuseppe Maria Poscetti (Rome Univ.) Dec. 1981 25 p refs In ITALIAN
(FUB-50-1981) Avail: NTIS HC A02/MF A01

A jitter computing method for repeaters in which the inlet pulse amplitude modulation signal is affected by jitter is presented. The method is an extension of a procedure permitting the computation of output jitter starting from the power and phase spectra at the outlet of the narrow band filter. A model of the repeater used for the analysis is described. The modifications of the spectra introduced by the inlet jitter and the phase relationship between modulated components at the outlet of the narrow band filter are examined. It is shown that the resulting outlet jitter may be computed as a sum of two terms dependent on the inlet jitter and the spectra characteristics. Author (ESA)

N83-14363# European Space Research and Technology Center, Noordwijk (Netherlands).
SIMULATION OF HIGH VOLTAGE BREAKDOWN IN THE GROUND NETWORK OF THE FAINT OBJECT CAMERA
I. Arens *In* ESA 2nd ESTEC Spacecraft Electromag. Compatibility Seminar Jul. 1982 p 141-154 (For primary document see N83-14345 05-32)
Avail: NTIS HC A10/MF A01

N83-14942# General Electric Co., Fairfield, Conn. Electronics Systems Programs Operation.
AN INTEGRAL EQUATION FOR THE DESIGN OF MAGNETIC FIELD COILS
J. F. Schenck, M. A. Hussain, W. A. Edelstein, and B. Noble (Wisconsin Univ., Madison) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 397-414 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 09/3

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N83-14422# British Library Lending Div., Boston Spa (England).
THE PRESSURE OF A FLAT JET ON A WALL IN THE PRESENCE OF AN ENCLOSING SURFACE
A. G. Klevtsov, V. A. Lazukov, and Yu. V. Shuvalov 2 Nov. 1982 4 p ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chernaya Met. (USSR), v. 9, 1981 p 173
(BLL-M-26776-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The attraction between a metal sheet and a plate with the inflow of a jet through a slit in the plate centre is analyzed, the limits of the effect determined, and the phenomenon explained in terms of the interaction of the jet with currents, circulating between the planes. Author

N83-14423 Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE TOLLMEIN-SCHLICHTING INSTABILITY OF LAMINAR VISCOUS FLOWS Ph.D. Thesis
Helen Louise Reed 1981 230 p
Avail: Univ. Microfilms Order No. DA8220667

Linear triple deck, closed-form solutions for two dimensional incompressible flow and for axisymmetric incompressible flow past bodies with porous suction strips are used to develop a simple linear optimization scheme to determine number, spacing, and mass flow rate through the strips on an axisymmetric body. The development of and documentation for a computer code for official distribution that interfaces with the transition analysis program system (TAPS) and suggests efficient configurations using this theory is described. For compressible three dimensional flow, the method of multiple scales is used to formulate the three dimensional stability problem and determine the partial differential equations governing variations of the amplitude and complex wave numbers. A method for following one specific wave along its trajectory to ascertain the characteristics of the most unstable disturbance is proposed. Dissert. Abstr.

N83-14424 Rutgers - The State Univ., New Brunswick, N. J.
THREE-DIMENSIONAL THERMAL CONVECTION OF AN INFINITE PRANDTL NUMBER FLUID IN A SPHERICAL SHELL Ph.D. Thesis
Mir Asad Ali Khan 1982 123 p
Avail: Univ. Microfilms Order No. DA8221679

Three dimensional thermal convection motions of an infinite Prandtl number Boussinesq fluid in a spherical shell are calculated using a Galerkin method. Convection motions are driven by a temperature difference imposed across the stress free, isothermal boundaries of the shell. The gravitational field is spherically symmetric and the local acceleration due to gravity is directly proportional to the radial position in the shell. Only the case of a shell whose outer adius is twice its inner radius is considered. Four distinct three dimensional solutions are obtained from different initial conditions, for the range of Rayleigh number slight more than three times critical. Thermal characteristics of these solutions (e.g., Nusselt numbers, average temperature distribution, square average velocities, isotherms and velocity vectors) are calculated and compared with the axisymmetric solutions. The four three dimensional solutions obtained gave the same Nusselt numbers and average temperatures profiles but different isotherms, velocity vectors and maximum velocities. Dissert. Abstr.

N83-14425 Rutgers - The State Univ., New Brunswick, N. J.
AN INVESTIGATION OF COMBINED FREE AND FORCED CONVECTION FOR LAMINAR HORIZONTAL CHANNEL FLOW WITH LOCAL HEAT SOURCES PRESCRIBED ON THE BOUNDARIES Ph.D. Thesis
Kevin John Kennedy 1982 149 p
Avail: Univ. Microfilms Order No. DA8221678

The interaction of combined free and forced convection heat transfer in horizontal channels with local sources prescribed on the boundaries is investigated. The flow is assumed to be steady, constant property, laminar, and two dimensional. Both numerical and experimental results are presented. The full two dimensional equations of motion and energy transport subject to the Boussinesq approximation are solved numerically. The method of false transient is successfully applied to this problem to predict temperature profiles, local heat transfer coefficients, and flow contours. The problem of fully developed laminar channel flow with constant wall heat flux is solved numerically. In the case of both walls heated at the same rate, a separated flow is created along the upper wall. The case of flow about a high dissipation local source for a Reynold's number of 37 is presented.
Dissert. Abstr.

N83-14426 Virginia Polytechnic Inst. and State Univ., Blacksburg.
EXPERIMENTS ON THE STABILITY OF THE FLAT-PLATE BOUNDARY LAYER WITH SUCTION Ph.D. Thesis
Gregory Alan Reynolds 1982 173 p Previously announced in AIAA as A82-37172
Avail: Univ. Microfilms Order No. DA8220668
For abstract see A82-37172.

N83-14427 Stanford Univ., Calif.
THE EFFECTS OF CONCAVE CURVATURE ON TURBULENT BOUNDARY LAYER STRUCTURE Ph.D. Thesis
Albert Hua Jeans 1982 174 p
Avail: Univ. Microfilms Order No. DA8220478

Concave curvature has a relatively large, unpredictable effect on turbulent boundary layers. Past studies have emphasized quantitative single point measurements. Some of these studies have suggested that a large scale, stationary array of counter-rotating vortices exists within the turbulent boundary layer on a concave wall. The objective of the present study was to obtain a qualitative model of the flow field in order to increase our understanding of the underlying physics and thereby guide future work. A large, free surface water channel was constructed in order to perform a predominantly visual study of the flow. Dyes and

hydrogen bubbles were used to mark the flow. Streamwise components of mean velocity and turbulence intensity were measured using a computer controlled hot film anemometer. Velocity measurements upstream of the start of curvature showed the boundary layer to be acceptably spanwise uniform with a momentum thickness Reynolds number of 1300. Dissert. Abstr.

N83-14428 Catholic Univ. of America, Washington, D.C.
LAMINAR FILM CONDENSATION OF A SATURATED VAPOR FLOWING OVER A HORIZONTAL CYLINDRICAL SHAPE Ph.D. Thesis
Marino DiMarzo 1982 146 p
Avail: Univ. Microfilms Order No. DA8221457

The classical problem of the laminar film condensation for a saturated vapor flowing over a cold horizontal cylindrical shape body is investigated. A rigorous formulation of the governing equations for the vapor boundary layer and the liquid film condensate are formulated to include both the gravity-driven body forces and the imposed pressure gradient caused by the flowing vapor. A generalized transformation of the governing equations allows a wide range of both Grashof and Reynolds numbers to be investigated. Numerical solutions in the transformed variables are obtained for both the no-flow and flow conditions over a range of Reynolds numbers and Jacob numbers. Formulation of the governing equations and numerical results are also obtained for the case of a noncondensible gas in the vapor (steam-air mixture). Preliminary findings are examined for the effects of the body shape on the heat transfer performance. Dissert. Abstr.

N83-14429*# Old Dominion Univ., Norfolk, Va.
IMPROVED FINITE ELEMENT METHODOLOGY FOR INTEGRATED THERMAL STRUCTURAL ANALYSIS Progress Report, period ending 30 Jun. 1982
Pramote Dechaumphai and Earl A. Thornton Washington NASA Nov. 1982 194 p refs
(Grant NsG-1321)
(NASA-CR-3635; NAS 1.26:3635) Avail: NTIS HC A09/MF A01 CSCL 20D

An integrated thermal-structural finite element approach for efficient coupling of thermal and structural analyses is presented. New thermal finite elements which yield exact nodal and element temperature for one dimensional linear steady state heat transfer problems are developed. A nodeless variable formulation is used to establish improved thermal finite elements for one dimensional nonlinear transient and two dimensional linear transient heat transfer problems. The thermal finite elements provide detailed temperature distributions without using additional element nodes and permit a common discretization with lower order congruent structural finite elements. The accuracy of the integrated approach is evaluated by comparisons with analytical solutions and conventional finite element thermal-structural analyses for a number of academic and more realistic problems. Results indicate that the approach provides a significant improvement in the accuracy and efficiency of thermal stress analysis for structures with complex temperature distributions. Author

N83-14430*# Arizona State Univ., Tempe. College of Engineering and Applied Sciences.
WAKES FROM ARRAYS OF BUILDINGS Final Report
Earl Logan, Jr. and Shu-Ho Lin Nov. 1982 127 p refs
(Contract NAS8-34318)
(NASA-CR-170666; NAS 1.26:170666) Avail: NTIS HC A07/MF A01 CSCL 20D

Experiments were carried out in a small wind tunnel in which atmospheric flow around buildings was simulated. Arrays of one, two, three, and four model buildings were tested, and wake profiles of velocity and turbulence were measured. The data indicate the effect of the buildings on the wind environment encountered by aircraft during landing or takeoff operations. It was possible to use the results to locate the boundaries of the air regions affected by the obstacles and to recommend preferred arrangements of buildings to maximize light safety. Author

N83-14431*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LENGTH TO DIAMETER RATIO AND ROW NUMBER EFFECTS IN SHORT PIN FIN HEAT TRANSFER
Barbara A. Brigham and G. James VanFossen 1982 10 p refs Proposed for presentation at the 28th Ann. Intern. Gas Turbine Conf., Phoenix, Ariz., 27-31 Mar. 1983; sponsored by ASME
(NASA-TM-83005; E-1442; NAS 1.15:83005) Avail: NTIS HC A02/MF A01 CSCL 20D

The relative effects of pin length to diameter ratio and of pin row geometry on the heat transfer from pin fins, was determined. Array averaged heat transfer coefficients on pin and endwall surfaces were measured for two configurations of staggered arrays of short pin fins (length to diameter ratio of 4). One configuration contained eight streamwise rows of pins, while the other contained only four rows. Results showed that both the 8-row and the 4-row configurations for an L sub p/D of 4, exhibit higher heat transfer than in similar tests on shorter pin fns (L sub p/D of 1/2 and 2). It was also found that for this L sub p/D ratio, the array averaged heat transfer was slightly higher with eight rows of staggered pins than with only four rows. J.D.

N83-14432*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASURED AND CALCULATED WALL TEMPERATURES ON AIR-COOLED TURBINE VANES WITH BOUNDARY LAYER TRANSITION
Curt H. Liebert, Raymond E. Gaugler, and Herbert J. Gladden 1982 12 p refs Proposed for presentation at the 28th Ann. Intern. Gas Turbine Conf., Phoenix, Ariz., 27-31 Mar. 1983; sponsored by ASME
(NASA-TM-83030; E-1466; NAS 1.15:83030) Avail: NTIS HC A02/MF A01 CSCL 20D

Convection cooled turbine vane metal wall temperatures experimentally obtained in a hot cascade for one vane design were compared with wall temperatures calculated with TACT1 and STAN5 computer codes which incorporated various models for predicting laminar-to-turbulent boundary layer transition. Favorable comparisons on both vane surface were obtained at high Reynolds number with only one of these transition models. When other models were used, temperature differences between calculated and experimental data obtained at the high Reynolds number were as much as 14 percent in the separation bubble region of the pressure surface. On the suction surface and at lower Reynolds number, predictions and data unsatisfactorily differed by as much as 22 percent. Temperature differences of this magnitude can represent orders of magnitude error in blade life prediction. Author

N83-14433*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLIGHT AND WIND-TUNNEL CORRELATION OF BOUNDARY-LAYER TRANSITION ON THE AEDC TRANSITION CONE
David L. Fisher and N. Sam Dougherty, Jr. (Rockwell International Corp., Huntsville, Ala.) Nov. 1982 27 p refs Presented at the AGARD Flight Mech. Panel Symp., Cesme, Turkey, 11-14 Oct. 1982
(NASA-TM-84902; NAS 1.15:84902) Avail: NTIS HC A03/MF A01 CSCL 20D

Transition and fluctuating surface pressure data were acquired on a 10 deg included angle cone, using the same instrumentation and technique over a wide range of Mach and Reynolds numbers in 23 wind tunnels and in flight. Transition was detected with a traversing pitot-pressure probe in contact with the surface. The surface pressure fluctuations were measured with microphones set flush in the cone surface. Good correlation of end of transition Reynolds number RE(T) was obtained between data from the lower disturbance wind tunnels and flight up to a boundary layer edge Mach number, M(e) = 1.2. Above M(e) = 1.2, however, this correlation deteriorates, with the flight Re(T) being 25 to 30% higher than the wind tunnel Re(T) at M(e) = 1.6. The end of transition Reynolds number correlated within + or - 20% with the surface pressure fluctuations, according to the equation used.

Broad peaks in the power spectral density distributions indicated that Tollmien-Schlichting waves were the probable cause of transition in flight and in some of the wind tunnels. Author

N83-14434*# Dynamics Technology, Inc., Torrance, Calif.
TURBULENCE MEASUREMENTS IN A SWIRLING CONFINED JET FLOWFIELD USING A TRIPLE HOT-WIRE PROBE
S. I. Janjua and D. K. McLaughlin 27 Dec. 1982 63 p refs Prepared for Oklahoma State Univ. Sponsored in part by Air Force Wright Aeronautical Labs.
(Grant NAG3-74)
(NASA-CR-169668; NAS 1.26:169668; DT-8178-02) Avail: NTIS HC A04/MF A01 CSCL 20D

An axisymmetric swirling confined jet flowfield, similar to that encountered in gas turbine combustors was investigated using a triple hot-wire probe. The raw data from the three sensors were digitized using ADC's and stored on a Tektronix 4051 computer. The data were further reduced on the computer to obtain time-series for the three instantaneous velocity components in the flowfield. The time-mean velocities and the turbulence quantities were deduced. Qualification experiments were performed and where possible results compared with independent measurements. The major qualification experiments involved measurements performed in a non-swirling flow compared with conventional X-wire measurements. In the swirling flowfield, advantages of the triple wire technique over the previously used multi-position single hot-wire method are noted. The measurements obtained provide a data base with which the predictions of turbulence models in a recirculating swirling flowfield can be evaluated. A.R.H.

N83-14435*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF VISUALIZED TURBINE ENDWALL SECONDARY FLOWS AND MEASURED HEAT TRANSFER PATTERNS
Raymond E. Gaugler and Louis M. Russell 1983 14 p refs Proposed for presentation at the 28th Ann. Intern. Gas Turbine Conf., Phoenix, Ariz., 27-31 Mar. 1983; sponsored by ASME
(NASA-TM-83016; E-1450; NAS 1.15:83016) Avail: NTIS HC A02/MF A01 CSCL 20D

Various flow visualization techniques were used to define the secondary flows near the endwall in a large heat transfer data. A comparison of the visualized flow patterns and the measured Stanton number distribution was made for cases where the inlet Reynolds number and exit Mach number were matched. Flows were visualized by using neutrally buoyant helium-filled soap bubbles, by using smoke from oil soaked cigars, and by a few techniques using permanent marker pen ink dots and synthetic wintergreen oil. Details of the horseshoe vortex and secondary flows can be directly compared with heat transfer distribution. Near the cascade entrance there is an obvious correlation between the two sets of data, but well into the passage the effect of secondary flow is not as obvious. M.G.

N83-14436# Science Applications, Inc., Wayne, Pa.
MANEUVERING AEROTHERMAL TECHNOLOGY (MAT) PROGRAM TEST SUMMARY REPORT. BICONIC BODY WITH SLICE/FLAP Final Report, 16 May 1980 - 15 Feb. 1982
A. Martellucci and S. Weinberg Jan. 1982 252 p refs
(Contract F04701-80-C-0033)
(AD-A118242; BMO-TR-82-28; SAI-067-82R-015) Avail: NTIS HC A12/MF A01 CSCL 16/3

Detailed shock layer surveys, surface heat transfer and pressure, and force and moment data were obtained on sharp and blunted bicone models tested under laminar and turbulent boundary layer flow conditions. The objective of these tests is to obtain basic body of data under hypersonic flow conditions, and under a variety of flow conditions and geometric parameters which would be useful for checking and validating the newly developed parabolized Navier-Stokes (PNS) codes, and other detailed flow field codes. GRA

N83-14437# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
AN EXPERIMENTAL INVESTIGATION OF THE UNSTEADY BEHAVIOR OF BLUNT FIN-INDUCED SHOCK WAVE TURBULENT BOUNDARY LAYER INTERACTIONS Final Report, 21 Nov. 1980 - 31 Dec. 1981
David S. Dolling and Seymour M. Bogdonoff May 1982 46 p refs
(Contract N60921-81-K-0007)
(AD-A118863; MAE-1562) Avail: NTIS HC A03/MF A01 CSCL 20/4

Blunt fin induced shock wave turbulent boundary layer interactions were studied. The characteristics of the fluctuating surface pressure distribution and the parameters controlling it were determined. The fin centerline and up to four diameters outboard of it were measured. It is shown that very high intensity r.m.s. pressure levels occur up to almost two orders of magnitude above that of the incoming boundary layer. The highest intensities occur on centerline ahead of the fin. The r.m.s. pressure distribution is characterized by three distinct peaks which decrease at different rates with distance outboard. Even four diameters off centerline, the maximum r.m.s. value in the distribution is still an order of magnitude larger than that of the incoming boundary layer. Outboard of the centerline, the r.m.s. pressure level downstream of the freestream shock wave steadily decreases. Within a distance of six to eight diameters it is close to the undisturbed value. With different diameter fins and different boundary layers, the qualitative characteristics are the same. The quantitative results depend on the ratio D/Delta. GRA

N83-14438# Howard Univ., Washington, D. C. Dept. of Mechanical Engineering.
NUMERICAL CALCULATIONS OF TURBULENT RECIRCULATING BEYOND TWO-DIMENSIONAL BACK-STEPS AND SUDDEN PIPE EXPANSIONS Final Report
Charles B. Watkins and Arthur M. Gooray Aug. 1982 243 p refs
(Contract N00014-80-C-0545)
(AD-A119392) Avail: NTIS HC A11/MF A01 CSCL 20/13

Results of an investigation of numerical modeling techniques for turbulent heat transfer in the recirculating and reattached flow downstream of two dimensional rearward-facing steps and sudden pipe expansions are presented. The computations were performed using an improved k-epsilon two-equation model of turbulence in a modified version of the Teach-T code. Author (GRA)

N83-14439# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.
REAL GAS CONSIDERATIONS FOR DETERMINING PHYSICAL AND THERMODYNAMIC PROPERTIES OF GASSES INVOLVED IN THE PREDICTION OF THE EFFECTS OF INTERNAL EXPLOSIONS M.S. Thesis
Lewis Keith Athow Jun. 1982 38 p refs
(AD-A119339) Avail: NTIS HC A03/MF A01 CSCL 19/4

An investigation into the thermodynamic properties of gaseous magnesium, aluminum and their oxides has been conducted to determine the validity of assuming ideal-gas-law behavior in confined explosions when these metals are present. A number of vapor phase equations of state were tested and compared. The paucity of experimental and rigorous theoretical data mandated the use of an equation of state that would provide realistic results and yet be tolerant of reasonable variations in the estimation of necessary parameters. The parameters selected are the vapor phase critical constants, which have been estimated from the theory of corresponding states or from partition function calculations. Using the Dieterici equation, which proved satisfactory in terms of the two criteria given above, it was determined that deviation from ideal gas behavior was insignificant except in the case of metal oxides, which may have a determinable effect on the equilibrium conditions of the explosion products. Author (GRA)

N83-14440# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
EFFECTS OF CONDENSATE INUNDATION AND VAPOR VELOCITY ON HEAT TRANSFER IN A CONDENSER TUBE BUNDLE

M.S. Thesis
Paul Jeffrey Noftz Jun. 1982 190 p refs
(SF43400391)
(AD-A119338; NPS69-82-001) Avail: NTIS HC A09/MF A01 CSCL 20/13

A five-tube column test condenser was modified to facilitate easier tube removal and installation and to allow for the simulation of larger depth tube bundles. Heat transfer coefficients were then determined for sixty-two runs conducted at steam supply pressures of 35, 40, 45, and 50 psig with the system operated at test condenser pressures of approximately 2 and 15 psia. Each run was five minutes long with temperature, pressure, and flow rate data taken at one minute intervals. The results revealed that the average tube wall temperature and the heat transfer coefficients for a given tube of a tube bundle increased as the mean vapor velocity increased, but decreased as the amount of condensate inundation increased. The experimentally obtained values for the heat transfer coefficients were compatible with the Nusselt predictions for the runs conducted at 15 psia, but greatly exceeded the Nusselt predictions for the runs conducted at 2 psia. However, for the 2 psia runs, the heat transfer coefficients for the top tubes agreed closely with an experimental correlation proposed by Fujii. The simulation of a tube bundle of more than five active tubes per column at the 2 psia test condenser pressure demonstrated heat transfer coefficients closer to the Nusselt theory than when only five active tubes were considered. GRA

N83-14441# Science Applications, Inc., McLean, Va.
ENERGY RELEASE FROM CONDENSED PHASE MATERIALS AND HETEROGENEOUS REACTIVE FLOW MODELING Final Report, 18 Jun. 1981 - 17 Jun. 1982
Kazhikathra Kailasanath and Ellis Hyman Jul. 1982 67 p refs
(Contract N00014-81-C-2418)
(AD-A119197; AD-E001333; SAI-83-831-WA) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes the results from investigations on: (1) the burning velocity of hydrogen in air, (2) the direct initiation of detonations in hydrogen air mixtures and, (3) the flow in and about fuel droplets. GRA

N83-14442# Maine Univ., Orono. Dept. of Physics.
INVESTIGATION OF BULK TURBULENCE AND NONLINEAR WAVE PHENOMENA IN LIQUID HELIUM Annual Report, 1 Oct. 1980 - 31 Mar. 1982
Charles W. Smith and James A. Rooney 1982 43 p refs
(Grant AF-AFOSR-3113-76; AF Proj. 2301)
(AD-A119209; AFOSR-82-0683TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Subharmonic Generation/Bifurcation In Liquid Helium--Measurements of the thresholds for the generation of first-sound sub-harmonics show a classical liquid response above the superfluid transition (T = 2.17 K) and bifurcation following the Feigenbaum universal convergence ratio below the superfluid transition. Ion-trapping techniques reveal that the threshold for the generation of the first subharmonic response corresponds to the threshold for acoustic generation of quantum vortex line. Acoustic Streaming In Liquid Helium--Quantitative measurements of acoustic streaming shows a classical response above T= 2.17 K. Below the superfluid transition we have shown that only the normal fluid component streams and that the temperature and frequency dependences are in quantative agreement with the Khalatnikov two-fluid hydrodynamic equations if the coefficient of second viscosity is properly taken into account. Heat Transfer between Copper and Liquid Helium--A conventional Kapitza resistance experiment with an acoustic streaming field directed transverse to the surface normal shows (1) no enhanced heat transfer below the superfluid transition and (2) above the superfluid transition the thermal conductance increases linearly with acoustic velocity amplitude reaching a value of 2.5 times the no sound level for a sound velocity amplitude of 0.8 centimeters/second. Author (GRA)

N83-14443# Naval Postgraduate School, Monterey, Calif.
INTEGRATION OF FINITE ELEMENT ANALYSIS PROGRAM FOR CONDUCTION HEAT TRANSFER WITH COMPUTER ANALYSIS LANGUAGE M.S. Thesis
Warren Leigh Roberts Jun. 1982 91 p refs
(AD-A119619) Avail: NTIS HC A05/MF A01 CSCL 09/2

The Finite Element Analysis Program (FEAP) was modified and integrated with the Naval Postgraduate School version of the Computer Analysis Language (CAL-NPS). This enables the solution of linear and non-linear, two and three dimensional heat conduction problems in an interactive mode. The usual types of boundary conditions, including radiation, may be specified. The heat conduction group includes prompts for user supplied data. Several existing CAL-NPS commands were improved and a 'HELP' facility was added. Commands were added for visual display of the finite element mesh at graphics terminals. The User Guide for this expanded version of CAL-NPS is provided. Author (GRA)

N83-14444# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
FINITE-ELEMENT METHOD FOR HEAT TRANSFER PROBLEM IN HYDRODYNAMIC LUBRICATION
Kwang June Bai Apr. 1982 36 p refs
(AD-A119621; DTNSRDC/SPD-1043-01) Avail: NTIS HC A03/MF A01 CSCL 20/13

Galerkin's finite element method is applied to a two dimensional heat convection-diffusion problem arising in the hydrodynamic lubrication of thrust bearing used in naval vessels. A parabolized thermal energy equation for the lubricant, and thermal diffusion equations for both bearing pad and the collar are treated together, with proper juncture conditions on the interface boundaries. It has been known that a numerical instability arises when the classical Galerkin's method, which is equivalent to a centered difference approximation, is applied to a parabolic-type partial differential equation. Probably the simplest remedy for this instability is to use a one-sided finite difference formula for the first derivative term in the finite difference method. However, in the present coupled heat convection-diffusion problem in which the governing equation is parabolized in a subdomain (lubricant), uniformly stable numerical solutions for a wide range of the Peclet number are obtained in the numerical test based on Galerkin's classical finite element method. In the present numerical computations, numerical convergency errors in several error norms are presented in the first model problem. Additional numerical results for a more realistic bearing lubricant problem are presented for a second numerical model. Author (GRA)

N83-14445# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
CONDUCTION PHASE CHANGE BENEATH INSULATED HEATED OR COOLED STRUCTURES
Virgil J. Lunardini Aug. 1982 48 p refs
(DA Proj. 4A1-61101-A-91-D)
(AD-A119595; CRREL-82-22) Avail: NTIS HC A03/MF A01 CSCL 20/13

The problem of thawing beneath heated structures on permafrost (or cooled structures in non-permafrost zones) must be addressed if safe engineering designs are to be conceived. In general, there are no exact solutions to the problem of conduction heat transfer with phase change for practical geometries. The quasi-steady approximation is used here to solve the conductive heat transfer problem with phase change for insulated geometries including infinite strips, rectangular buildings, circular storage tanks, and buried pipes. Analytical solutions are presented and graphed for a range of parameters of practical importance. Author (GRA)

N83-14446# Rockefeller Univ., New York.
SHOCK WAVE CALCULATIONS Final Report, 1 Jul. 1979 - 30 Jun. 1982
James Glimm 30 Jun. 1982 5 p refs
(Contract DAAG29-79-C-1079)
(AD-A119645; ARO-16006.11-MA) Avail: NTIS HC A02/MF A01 CSCL 20/4

Discontinuities in Physical Systems and especially fluids have been studied from the points of view of Scientific modelling, numerical analysis, simulation and software. Author (GRA)

N83-14447# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
AN EXPERIMENTAL APPARATUS TO STUDY ENHANCED CONDENSATION HEAT TRANSFER OF STEAM ON HORIZONTAL TUBES M.S. Thesis
Raymond Lynn Krohn Jun. 1982 55 p refs
(AD-A119582) Avail: NTIS HC A04/MF A01 CSCL 13/1

In an effort to explore the possibility of building compact naval steam condensers, an experimental apparatus was designed and constructed to study enhanced condensation heat transfer of steam on horizontal tubes. Special care was taken to ensure a leak-tight apparatus so that the non-condensable gas content of the steam can be kept to a few parts-per-million. The boiler and steam piping is made of glass and stainless steel with rubber gaskets. Copper is used for the condensing tubes. The completed system has been tested satisfactorily at full power. Author (GRA)

N83-14448# Minnesota Univ., Minneapolis. Hydraulic Lab.
AN EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF AN AIR BUBBLE LAYER ON RADIATED NOISE AND SURFACE PRESSURE FLUCTUATIONS IN A TURBULENT BOUNDARY LAYER Final Report, Jan. 1980 - Sep. 1981
John M. Killen Sep. 1981 29 p refs
(Contract N00014-80-C-0209; SR2301001)
(AD-A119804; Rept-202) Avail: NTIS HC A03/MF A01 CSCL 20/4

An experimental investigation is described which shows relationships between the noise spectra of a layer of air bubbles in a turbulent flow and a maximum stable bubble size which can exist in the same flow. An air bubble layer with individual bubble sizes greater than a maximum stable size was introduced into the boundary layer of water flowing along a smooth flat plate. It was found that the maximum stable bubble size was related to the turbulent kinetic energy dissipation as had been previously shown by other investigators for a variety of turbulent flows. A unique 'corner frequency' of the noise spectra which resulted from the bubble splitting down to a maximum stable size could be also related to the turbulent kinetic energy dissipation of the boundary layer flow. Author (GRA)

N83-14449# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
EXPERIMENTAL AND THEORETICAL STUDIES OF THE EFFECT OF GAS CONTENT ON UNSTEADY CAVITY FLOWS Final Report, 1 Oct. 1979 - 31 Jan. 1981
Robert J. VanHouten and H. Clayton Sayre Jan. 1982 112 p refs
(Contract N00014-80-C-0224)
(AD-A119800; Rept-82-1) Avail: NTIS HC A06/MF A01 CSCL 13/10

A partially cavitating two dimensional hydrofoil was oscillated in pitch while air was bled into the cavity at a controlled rate. By varying the ambient pressure and air flow rate simultaneously, a constant ventilation number was maintained for a series of cavity air partial pressures. Unsteady forces and cavity pressures were measured, and photographs taken. It was found that cavity air caused fluctuating cavity pressures, and tended to stabilize cavity length. Its effect on force coefficients was relatively modest. These trends were also found from a parallel theoretical investigation in which a computer program which predicts unsteady cavitation of 2-D foils was modified to allow for cavity gas. Author (GRA)

N83-14450# Sandia Labs., Albuquerque, N. Mex.
INTERMEDIATE-RANGE EXPLOSION AIRBLAST PROPAGATIONS
J. W. Reed 1981 16 p refs Presented at Joint Army-Navy-NASA-AF Interagency Propulsion Comm. Meeting, Cape Canaveral, Fla., 17 Nov. 1981
(Contract W-7405-eng-36)
(DE82-002436; SAND-81-2425C; CONF-811134-1) Avail: NTIS HC A02/MF A01

Airblasts were recorded from several hundred small explosions (2.3 kg to 1145 kg TNT) under intensively observed weather conditions to refine propagation productions. Some modern rocket propellants may be accidentally detonated to cause an explosion airblast hazard to tens of kilometers range, depending on atmospheric acoustic refraction conditions. Correlations between weather and airblast propagation strength will be used to estimate accidental explosion airblast overpressures at surrounding communities, the expected damage to windows and other sensitive structural components, and the hazard to people from breaking and falling glass. GRA

N83-14451# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Mechanical Engineering.
WALL HEAT TRANSFER AND FLAME PROPAGATION IN A CONSTANT VOLUME DUCT
J. B. Woodard, D. H. Hirvo, R. Greif, and R. F. Sawyer Oct. 1981 44 p refs Presented at the Western States Sect. Meeting of the Combust. Inst., Tempe, Ariz., 19 Oct. 1981
(Contract W-7405-eng-48)
(DE82-001939; LBL-13021; CONF-811041-3) Avail: NTIS HC A03/MF A01

Simultaneous data on single event flame propagation, wall heat transfer, and their interactions were obtained for a constant volume chamber. Pressure variation, wall temperature variation, and high speed schlieren movies were obtained for the combustion of methane and air in a constant volume duct of square cross section for a series of equivalence ratios. Flame speed and wall heat flux variation with respect to time were calculated from the data. The results seem to indicate that there are important geometry effects on flame speed due to side wall interaction. The wall heat flux data show effects due to pressure rise and due to the flame location relative to the location of the heat transfer measurement. DOE

N83-14452# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Div. de la Physique.
TRANSITION TO TURBULENCE
Y. Pomeau Jun. 1981 23 p refs In FRENCH; ENGLISH summary Presented at the Conf. of the French Phys. Soc., Clermont-Ferrand, France, 29 Jun. 1981
(DE81-700564; CEA-CONF-5794; CONF-8106170-1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A few known types of transition to turbulence, as the cascade of period doubling and the intermittent transition, are reviewed. This happens in dynamical systems with a few degrees of freedom, as modelled by the iteration of nonlinear maps. Then specific transitions for systems with many degrees of freedom are presented. The occurence of a low frequency broadband noise in large cells at the onset of Rayleigh-Benard convection and the transition by intermittent bursts in parallel flows are considered. In this last case, one is concerned with localized and finite amplitude perturbations. Simple geometric arguments show that these fluctuations, when they are isolated and with a well diffinite relative speed, exist for a single value of the Reynolds number only. DOE

N83-14453# United Technologies Research Center, East Hartford, Conn.
HEAT-EXCHANGER CONCEPTS FOR NEUTRAL-BEAM CALORIMETERS
C. C. Thompson, D. H. Polk (California Univ., Lawrence Livermore Lab.), D. J. McFarlin, and R. Stone 5 Oct. 1981 6 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct., 1981
(Contract W-7405-eng-48)
(DE82-003126; UCRL-85948; CONF-811040-108) Avail: NTIS HC A02/MF A01

Advanced cooling concepts that permit the design of water cooled heat exchangers for use as calorimeters and beam dumps for advanced neutral beam injection systems were evaluated. Water cooling techniques ranging from pool boiling to high pressure,

high velocity swirl flow were considered. Preliminary performance tests were carried out with copper, inconel and molybdenum tubes ranging in size from 0.19 to 0.50 in. diameter. Coolant flow configurations included: (1) smooth tube/straight flow; (2) smooth tube with swirl flow created by tangential injection of the coolant; and (3) axial flow in internally finned tubes. Additionally, the effect of tube L/D was evaluated. A CO2 laser was employed to irradiate a sector of the tube exterior wall; the laser power was incrementally increased until burnout occurred. Absorbed heat fluxes were calculated by dividing the measured coolant heat load by the area of the burn spot on the tube surface. Two six element thermopiles were used to accurately determine the coolant temperature rise. A maximum burnout heat flux near 14 kW/sq cm was obtained for the molybdenum tube swirl flow configuration. GRA

N83-14454# Los Alamos Scientific Lab., N. Mex.
NUMERICAL SIMULATION OF FLUID FLOW IN POROUS/FRACTURED MEDIA
Bryan J. Travis and Thomas L. Cook 1981 8 p refs Presented at the 5th Uranium Seminar, Albuquerque, N. Mex., 20-23 Sep. 1981
(Contract W-7405-eng-36)
(DE82-002631; LA-UR-81-3256; CONF-810949-2) Avail: NTIS HC A02/MF A01

Theoretical models of fluid flow in porous/fractured media can help in the design of in situ fossil energy and mineral extraction technologies. Because of the complexity of these processes, numerical solutions are usually required. Sample calculations illustrate the capabilities of present day computer models. DOE

N83-14455# Florence Univ. (Italy). Sezione Macchine.
FINITE ELEMENTS IN FLUID DYNAMICS [ELEMENT FINITI EN FLUIDODINAMICA]
Francesco Martelli 1980 19 p In ITALIAN
Avail: NTIS HC A02/MF A01

The finite element method and its applications to fluid dynamics are explained. The variational and the weighted residuals approaches to transforming the differential equations problem in an algebraic problem are described. Particular cases are studied, including the blade to blade flow, trough-flow calculations in turbomachinery and lubrication by high viscosity fluids.
Author (ESA)

N83-14935# Rockefeller Univ., New York. Dept. of Mathematics.
A GENERALIZED RANDOM CHOICE METHOD FOR GAS DYNAMICS
James Glimm, Guillermo Marshall, and Bradley Plohr *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 137-148 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 20/4

N83-14937# Army Armament Research and Development Command, Dover, N. J. Fire Control and Small Caliber Weapon Systems Lab.
NUMERICAL RESULTS OF TRANSIENT TWO-DIMENSIONAL HEAT CONDUCTION
R. Yalmanachili *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 293-304 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 20/4

N83-14943# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
ELEMENT TYPE COMPARISON IN BASIN OSCILLATION ANALYSIS
Mark D. Prater and Keith W. Bedford (Ohio State Univ., Columbus) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 415-428 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 20/4

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N83-14456 Stanford Univ., Calif.
BEAM-FORMING TECHNIQUES WITH APPLICATIONS TO PULSED DOPPLER ULTRASONIC FLOWMETERS Ph.D. Thesis
Chong-Cheng Fu 1982 195 p
Avail: Univ. Microfilms Order No. DA8220461

The near-field and array approaches to beam forming appear to be the most practical and useful methods for providing uniform illumination of the cross section of blood vessels. Through the near-field approach, the required beam patterns are produced in the near field of pulsed transducers and, as a result, it is most suitable for peripheral applications. Field patterns of pulsed transducers are defined and are investigated by theoretical analysis, numerical simulation, and experimental characterization to verify the validity and indicate the limitations of this approach. Transducers are designed and fabricated, based on these results, and are employed in the preliminary flowmeter system evaluation. The use of transducer arrays is the only viable approach to deepbody measurements and flexible beamwidth adjustment. A theory, founded on the finite Fourier-Bessel and Dini series expansions, is developed to synthesize circularly symmetrical beam patterns by means of concentric annular arrays. Its application to the generation of variable-width uniform beams results in a canonical design procedure. A prototype transducer array suitable for transcutaneous cardiac-output estimation was developed.
Dissert. Abstr.

N83-14457# Three C Systems, Inc., Wynnewood, Pa.
DESIGN OF 50,000G ACCELEROMETER CALIBRATION SYSTEM
Murray Kornhauser Aberdeen Proving Ground, Md. Army Armament Research and Development Command Aug. 1982 108 p refs
(Contract DAAK11-80-C-0006; DA Proj. 1L1-62618-AH-80)
(AD-A119173; AD-F300081; ARBRL-CR-00487) Avail: NTIS HC A06/MF A01 CSCL 14/2

The design, analysis and selection of the implemented system from alternate systems is discussed. The full details of the electrical and mechanical components are given. Included in the appendices are the manual for installation and maintenance and the operating procedures. GRA

N83-14458# Defense Mapping Agency Aerospace Center, St. Louis, Mo. ATM/NAV Plan Charting Div.
TILT DETERMINATION OF NON-VERTICAL PHOTOGRAPHY USING A HANDHELD PROGRAMMABLE CALCULATOR
Roberta L. Braundel and Philip K. Alderman 1982 23 p refs Presented at the 2nd Pan-Am. and 7th Natl. Congr. on Photogrammetry, Photointerpretation, and Geodesy, Mexico City, 28 Sep. - 1 Oct. 1982
(AD-A119493) Avail: NTIS HC A02/MF A01 CSCL 14/5

An easy to use, inexpensive, and rapid system for determination of tilt in an aerial photograph has been developed at the Defense Mapping Agency Aerospace Center. Image measurements are made with a calibrated template and tube magnifier. Geodetic control points are then scaled from a large scale map source. Tilt determination is then accomplished using Church's resection on a programmable calculator, and allows for computation of surface feature lengths, widths, and heights from a single image.
Author (GRA)

N83-14459# Lake Shore Cryotronics, Inc., Westerville, Ohio.
A LOW RESISTANCE INFRARED BOLOMETER FOR USE WITH A SQUID DETECTION SYSTEM Final Report, 1 Apr. - 31 Jul. 1982
Philip R. Swinehart 24 Sep. 1982 48 p refs
(Contract N00014-82-C-0286)
(AD-A119775) Avail: NTIS HC A03/MF A01 CSCL 17/4

Low resistance thin film bolometers for infrared detection when impedance matched to a SQUID amplifier were fabricated from a range of gold/germanium alloys (12 to 25 atomic per cent gold). The low resistances of 0.1 to 0.2 ohms, including contact resistances, were obtained in the direction perpendicular to the film plane. High resistance versions with conduction parallel to the film plane were fabricated simultaneously. The resistance for the parallel conduction was characteristic of a semiconductor, but for the perpendicular mode it was characteristic of a metal. Available data suggests that the metallic conduction was caused by uncontrolled gold particle sizes which could equal the thickness of the film. Author (GRA)

N83-14460# Grenoble Univ. (France).
TEST OF A PROPORTIONAL TUBE MODULUS USED TO LOCALIZE THE ELECTROMAGNETIC SHOWERS IN A CALORIMETER Ph.D. Thesis
Jean-Pierre Lees 1981 126 p refs In FRENCH; ENGLISH summary
(DE81-700355; LAPP-EX--81-01) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

In this work are given results of a test in an electron-hadron beam (5-92 GeV) of the prototype of a position detector. This position detector consists of proportional tubes with charge division readout; it will be used in the end cap electromagnetic calorimeter ('bouchon') of the UA1 experiment at CERN (pantip collisions at a center of mass energy of 540 GeV). This detector gives the position of the showers, and also a coarse value of their energy. Results about properties of the tubes (saturation phenomena, position and energy accuracies) and, then, results about the development of high energy electromagnetic showers in lead-plastic sandwich are given here. DOE

N83-14461# Brookhaven National Lab., Upton, N. Y.
SMALL CELL DRIFT CHAMBERS AND DRIFT CHAMBER ELECTRONICS AT ISA
E. Platner 1981 5 p ref Presented at the Phys. Opportunities at ISABELLE Summer Workshop, Upton, N.Y., 20 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE82-001817; BNL-30163; CONF-810759-6) Avail: NTIS HC A02/MF A01

The new detector systems for MPS II was developed and several custom IC's were produced which are of interest to High Energy Physics detectors. The circuit requirements were determined to achieve performance limited only by the physical processes of the detectors. The detectors reside in 5 to 10 Kg magnetic fields and must efficiently detect multibody final state events in the presence of beam levels approaching several times 10 to the sixth power per second. GRA

N83-14462# Mound Lab., Miamisburg, Ohio.
SECONDARY ION MASS SPECTROMETERS (SIMS) FOR CALCIUM ISOTOPE MEASUREMENTS AS AN APPLICATION TO BIOLOGICAL SAMPLES
Stephen M. Craven, James R. Hoenigman (Dayton Univ.), and William E. Moddeman Nov. 1981 12 p refs
(Contract DE-AC04-76DP-00053)
(DE82-004301; MLM-2875) Avail: NTIS HC A02/MF A01

The potential use of secondary ion mass spectroscopy (SIMS) to analyze biological samples for calcium isotopes is discussed. Comparison of UTI and Extranuclear based quadrupole systems is made on the basis of the analysis of CaO and calcium metal. The Extranuclear quadrupole based system is superior in resolution and sensitivity to the UTI system and is recommended. For determination of calcium isotopes to within an accuracy of a few percent a high resolution quadrupole, such as the Extranuclear, and signal averaging capability are required. Charge neutralization will be mandated for calcium oxide, calcium nitrate, or calcium oxalate. SIMS is not capable of the high precision and high accuracy results possible by thermal ionization methods, but where faster analysis is desirable with an accuracy of a few percent, SIMS is a viable alternative. DOE

N83-14463# Los Alamos Scientific Lab., N. Mex.
THIN-FILM THICKNESS MEASUREMENT USING X-RAY PEAK RATIONING IN THE SCANNING ELECTRON MICROSCOPE
N. E. Elliott, W. E. Anderson, T. A. Archuleta, and D. M. Stupin 1981 7 p refs Presented at Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981
(Contract W-7405-eng-36)
(DE82-000558; LA-UR-81-2723; CONF-811113-23) Avail: NTIS HC A02/MF A01

Laser target film thickness was measured by a scanning electron microscope. This method is generally applicable to any coating on any substrate as long as the electron energy is sufficient to penetrate the coating and the substrate produces an X-ray signal which can pass back through the coating and be detected. DOE

N83-14464# Riso National Lab., Roskilde (Denmark).
A NORDIC INTERCOMPARISON OF DETECTOR SYSTEMS FOR BACKGROUND RADIATION MONITORING
Lars Boetter-Jensen and Sven Poul Nielsen Apr. 1981 31 p refs
(RISO-M-2266) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Detector systems for background radiation monitoring were compared. Ionization chambers appeared to yield the most reliable results but large variations of detector responses were found when the instruments were exposed identically. The need for intercomparison programmes and for establishing standardized calibration procedures is demonstrated. The program is described and presents the results for the assessment of background radiation monitoring with different sensitive doserate meters and integrating T1 dosimeters are presented. DOE

N83-14465# Utrecht State Univ. (Netherlands).
DESIGN OF A COMPTON-SUPPRESSION SPECTROMETER AND ITS APPLICATION TO THE STUDY OF HIGH-SPIN YRAST STATES Ph.D. Thesis
Hendrikus Johannes Maria Aarts 21 Jan. 1981 69 p refs
(INIS-MF-6523) Avail: NTIS (US Sates Only) HC A04/MF A01; DOE Depository Libraries

Gamma ray spectroscopy of high-spin states is hampered by transitions with low intensity on a high gamma ray background. An approach to enhance weak peaks in a spectrum in the reduction of the Compton background by means of a Compton-suppression spectrometer (CSS). Optimization of a CSS by means of Monte Carlo calculations is described. The investigation of high-spin states in the sd-shell nucleus Ar-38 with a Compton-suppression spectrometer is reported. With previously described techniques, in combination with p-gamma coincidence measurements to establish an unambiguous level scheme, states up to Jsup(pi) = 11- could be identified and investigated. A gamma-gamma coincidence experiment on the nuclei Hf-167 and 168 is described with two Compton-suppression spectrometers. Yrast bands are followed, beyond the region of the first backbending, up to spin J = 37/2 and J = 28 for Hf-167 and Hf-168, respectively. DOE

N83-14466# Grenoble Univ. (France). Lab. de Physique des Particules.
NEW TYPE OF POSITION SENSITIVE PHOTOMULTIPLIER
Kei-ichi Kuroda, Daniel Sillou, and Fujio Takeutchi (Carnegie-Mellon Univ.) 1980 44 p refs
(LAPP-80-00) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A position sensitive photomultiplier of a new concept is presented which is based on the scaling property of the equation of motion describing electrons moving inside electric and magnetic fields. The idea has been fully supported by a test using a prototype

having ten stages of specially designed dynodes. A gain of 100,000 approximately 1 million, and a spatial resolution of approximately 3.4 mm (FWHM) in two dimensional space have been obtained. The time resolution is comparable or superior to that of most conventional photomultipliers. An example of data handling of signal is coming from divided anode cells showed a possibility of reconstructing impact light position with a precision of a few hundreds microns. DOE

N83-14467# Riso National Lab., Roskilde (Denmark).
INTERCOMPARISON OF DETECTORS FOR MEASUREMENT OF BACKGROUND RADIATION
Sven P. Nielsen and Lars Boetter-Jensen Apr. 1981 39 p refs (RISO-M-2239; ISBN-87-550-0755-4; ISSN-0418-6435) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Measurements of the background radiation were made in 1978 at 14 locations with a high pressure ionization chamber, thermoluminescence dosimeters (TLD's), two NaI(Tl) detectors, and a Ge(Li) spectrometer system. Simultaneous measurements with the ionization chamber and the spectrometer system provide reliable estimates of the total background exposure rate, of the individual contributors to the terrestrial exposure rate, and of the exposure rate from the secondary cosmic radiation. The TLD results agree with those of the ionization chamber. The NaI(Tl) detector results show that accurate estimates of the terrestrial exposure rate can be obtained if empirical corrections are applied. DOE

N83-14335*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELECTRONIC SIMULATION OF A BAROMETRIC PRESSURE SENSOR FOR THE METEOROLOGICAL MONITOR ASSEMBLY
C. N. Guiar and L. W. Duff *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 95-103 (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N83-14468 Dartmouth Coll., Hanover, N.H.
CHARACTERIZATION OF A CERENKOV MASER Ph.D. Thesis
Scott Alan VonLaven 1982 96 p
Avail: Univ. Microfilms Order No. DA8223847

The interaction of a magnetized electron beam with a slow guided electromagnetic wave was studied. An electron beam driven, dielectric lined, cylindrical waveguide produced 30-100 kilowatts of coherent radiation over an octave band on the TM01 mode of the waveguide. Operation on the TM01 mode of the waveguide. Operation on the TM02 mode was realized as well. Impedance mismatches at the end of the liner section provide a reflected signal, which undergoes amplification during successive passes. The growth rate of the interaction is calculated, taking into account the cylindrical geometry of the experiment, for the collective regime and for the single particle regime. Dissert. Abstr.

N83-14469 California Inst. of Tech., Pasadena.
GIGAWATT PICOSECOND DYE LASERS AND ULTRAFAST PROCESSES IN SEMICONDUCTOR LASERS Ph.D. Thesis
Thomas Lawson Koch 1982 258 p
Avail: Univ. Microfilms Order No. DA8219906

A gigawatt picosecond dye laser oscillator-amplifier system, and the application of that system to the study of ultrafast lasing and carrier dynamics in semiconductor lasers was investigated. Traveling wave rate equations, nonlinear pulse propagation in a generalized two level amplifying/absorbing medium is discussed. The construction and operation of a three stage Nd:YAG laser pumped picosecond dye laser amplifier chain is described. Picosecond time domain measurement techniques are discussed, focussing on nonlinear optical methods. The output of the picosecond dye laser system is used to optically generate high carrier densities in semiconductor lasers, and the ensuing short pulse lasing dynamics are investigated and compared to the predictions of a simple rate equation analysis. A model is developed which includes both broadband stimulated emission as well as many valley and hot electron effects in the semiconductor. It is concluded that the picosecond lasing dynamics of semiconductor lasers can be understood by a fundamental analysis which includes the dynamics of the optical energy exchange in the laser cavity, and the detailed picosecond dynamics of the semiconductor material. Dissert. Abstr.

N83-14470# Pittsburgh Univ., Dept. of Physics.
THEORETICAL STUDIES OF ELECTRON CONDUCTION THROUGH ATTACHING GASES
30 Jun. 1982 3 p refs
(Contract N00014-82-C-0021; Grant NSF PHY-81-05074; NR Proj. 394-056)
(AD-A118955) Avail: NTIS HC A02/MF A01 CSCL 20/5

The major goal is to identify a gas mixture with two phases, one of low electrical resistivity and the other of high resistivity, which can be changed rapidly from one phase to the other. The transition could be achieved electrically through changes in the applied voltage, or optically through irradiation by laser light. Such a gas might form the active medium in a diffuse discharge switch that could operate without the movement of electrodes or the addition of large amounts of gas during the opening of the switch. Author (GRA)

N83-14471# Naval Research Lab., Washington, D. C. Laser Plasma Branch.
THE NONLINEAR ASPECTS OF THE RAYLEIGH-TAYLOR INSTABILITY IN LASER ABLATION Interim Report
M. H. Emery, J. H. Gardner, and J. P. Boris 3 Sep. 1982 25 p refs
(Contract DE-AI01-76ET-53020)
(AD-A118979; NRL-MR-4882) Avail: NTIS HC A02/MF A01 CSCL 20/5

We report on our investigation of the Rayleigh-Taylor (R-T) and Kelvin-Helmholtz (K-H) instabilities in laser ablatively accelerated targets for single mode perturbations for a series of wavelengths in the parameter regime 1/2 less than or equal to lambda/delta R less than or equal to 10, where lambda is the wavelength of the perturbation and delta is the cold foil thickness. We find linear growth rates well below classical values (by a factor on the order of 3-4). We also find a cutoff in the growth rates for wavelengths less than the foil thickness. The striking result is the dominance of nonlinear effects; i.e., the K-H instability for short wavelength perturbations. Although the linear growth rates increase as k1/2 up to the cutoff, the K-H rollup dominates at large k, drastically reducing the penetration rate of the dense spike below its free fall value and effectively doubling the aspect ratio of the foil. In other words, it is the long wavelength perturbations that are most effective in destroying the symmetric implosion of the shell. GRA

N83-14472# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF ENERGY COUPLING IN VARIOUS ARC SUSCEPTIBLE AND RESISTANT CONDUCTORS M.S. Thesis
Robert Morton Metheny Jun. 1982 124 p refs
(AD-A119332) Avail: NTIS HC A06/MF A01 CSCL 20/5

Thermal energy and momentum coupling to four target materials was investigated to determine what effect unipolar arcing had on the coupling process. A review of the various mechanisms of energy coupling to targets irradiated by laser energy, including unipolar arching, is presented along with some previous experimental results. The experiments were conducted in a 10 to the minus six torr. Vacuum using a neodymium-glass laser in the Q-switched mode. Unipolar arcing was seen to occur on tantalum and SS 304 targets, but not on the TiC TiN coated targets. Thermal coupling was higher in the arc prone targets, while the listing of materials in increasing order of momentum coupling varied through the intensity range under consideration. Unipolar arcing is proposed as a possible mechanisms for the increased thermal coupling.

The inability to determine accurately the amount of target material removed by the unipolar arcing process prevented any definitive statement of its effect on momentum coupling. Author (GRA)

N83-14473# Michigan Univ., Ann Arbor. Laser Plasma Research Lab.

BOUNDARY EFFECTS ON THE DYNAMICS OF CHANNELS BY LASER-INITIATED DISCHARGES Interim Report

L. D. Horton and R. M. Gilgenbach 15 Jul. 1982 13 p refs
(RR0110901; NR Proj. 012-756)
(AD-A119316; LPRL-TR-108) Avail: NTIS HC A02/MF A01 CSCL 20/5

The dynamics of unbounded and bounded reduced density channels have been characterized by means of ruby laser schlieren photography. These channels are produced by CO2 laser initiated discharges in clean atmospheric pressure air. Bounded channels exhibit a significant compression in width and earlier onset of fine scale turbulence. These results could impact proposed designs for inertial fusion reactors relying upon reduced density channels for particle transport through gas blankets. Author (GRA)

N83-14474# Battelle Columbus Labs., Ohio. Physical Sciences Section.

LASER PRODUCED X-RAYS FOR HIGH RESOLUTION LITHOGRAPHY Interim Report, 15 Dec. 1981 - 3 Aug. 1982

Harold M. Epstein 3 Aug. 1982 20 p refs
(Grant AF-AFOSR-0066-82; AF Proj. 2301)
(AD-A119268; AFOSR-82-0685TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

It has been demonstrated that a relatively small, high repetition rate laser can be a most attractive high average power source of X-rays in the 3/4 to 2 keV range. This X-ray energy range is particularly significant for X-ray microlithography of integrated circuits. Mode locked Nd-YAG lasers focused to several tens of micrometer spot sizes are very efficient X-ray sources for this purpose. Over ten percent of the laser light can be converted to X-rays of energy over 1 keV with a 400 mj 200 psec laser. Mode locked lasers with repetition rates of 10Hz and the above outputs are available now. Applicable laser systems with much higher average power should be available in the near future.
Author (GRA)

N83-14475# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TARGET INDICATION USING A LASER RANGE-FINDER, WORKING OUT THE DATA ON AN HP-25 POCKET CALCULATOR

P. Navarin 29 Jul. 1982 11 p Transl. into ENGLISH from Vojni Glasnik (Yugoslavia), v. 34, no. 1(339), Jan. - Feb. 1980 p 31-35
(AD-A118933; FTD-ID(RS)T-0678-82) Avail: NTIS HC A02/MF A01 CSCL 20/5

The use of a laser range finder in conjunction with an HP-25 pocket electronic calculator for artillery operations is discussed. A case study of a combat mission is given. R.J.F.

N83-14476# National Bureau of Standards, Washington, D.C.

LASER COOLING AND TRAPPING OF NEUTRAL ATOMS Annual Summary Report, 1 Oct. 1981 - 30 Sep. 1982

William D. Phillips Sep. 1982 4 p
(Contract N00014-82-F-0005; RR0110303)
(AD-A119167) Avail: NTIS HC A02/MF A01 CSCL 20/5

Using a resonant, counterpropagating laser beam we have reduced the velocity of atoms in a neutral thermal sodium beam to 40 m/s, or 4% of their initial velocity. The temperature characterizing the atoms' relative motion was reduced to 70 mK.
Author (GRA)

N83-14477# Rochester Univ., N. Y. Dept. of Chemistry.

THEORY OF LASER-STIMULATED SURFACE PROCESSES. 1: GENERAL FORMULATION FOR THE MULTIPHONE RELAXATION OF A VIBRATIONALLY EXCITED ADATOM Interim Technical Report

A. C. Beri and Thomas F. George Aug. 1982 41 p refs Submitted for publication
(Contract N00014-80-C-0472; Grant AF-AFOSR-0046-82)
(AD-A119193; UROCHESTER/DC/82/TR-21) Avail: NTIS HC A03/MF A01 CSCL 20/5

A general expression is obtained for the rate of energy transfer from an adatom-surface bond in an excited vibrational state due to IR laser irradiation to vibrational modes of the solid. The rate is seen to involve time Fourier transforms of powers of a correlation function for the displacement of different lattice particles at different times, reciprocal-space Fourier components of a suitably chosen pair potential between the adatom and each lattice atom and a weight factor associated with the laser-excited state of the adatom-surface bond. This 'factorization' of the energy transfer rate into components depending on the properties of the laser, those of the adatom-surface bond and those of the solid provides a simple physical picture of the relaxation process within a rigorous framework and strongly suggests many points of departure towards more phenomenological approaches to laser-stimulated surface processes. Author (GRA)

N83-14478# Rochester Univ., N. Y. Dept. of Chemistry.

QUANTUM MODEL OF LASER EXCITATION OF ISOTOPIC SPECIES ADSORBED ON A SOLID SURFACE Interim Technical Report

Jui-Teng Lin, Xi-Yi Huang, and Thomas F. George Aug. 1982 20 p refs
(Contract N00014-80-C-0472)
(AD-A119235; TR-22) Avail: NTIS HC A02/MF A01 CSCL 20/5

A quantum model of laser-excited interacting isotopic adspecies is presented. The bistability governed by a cubic equation of the active-mode-excitation is analyzed in terms of the nonlinear effects of the anharmonicity, where the transition point and critical laser intensity are exactly calculated. The isotopic selectivity governed by the frequency difference and the coupling strength of the active modes are investigated. GRA

N83-14479# Howard Univ., Washington, D. C. Dept. of Chemistry.

PHOTODISSOCIATION DYNAMICS IN A PULSED MOLECULAR BEAM

Richang Lu, J. B. Halpern, and William M. Jackson 16 Sep. 1982 27 p refs
(Contract N00014-80-C-0305)
(AD-A119772; TR-13-ONR) Avail: NTIS HC A03/MF A01 CSCL 20/5

The ArF laser photodissociation of C2N2, C1CN and BrCN have been studied in a pulsed beam. Comparisons are made between these results and the radical product distributions measured in an effusive beam. Comparisons are also made between the effects of cooling by expansion in argon and expansion in methane. The later is known to more effectively cool vibrational modes in the parent molecule. Author (GRA)

N83-14480# Naval Research Lab., Washington, D. C.

FLASH X RADIOGRAPHY OF LASER-ACCELERATED TARGETS

R. R. Whitlock, S. P. Obenschain, and J. Grun 30 Aug. 1982 10 p refs
(AD-A119569; NRL-MR-4860) Avail: NTIS HC A02/MF A01 CSCL 20/6

Flash X radiography of ablatively accelerated planar foils has provided quantitative measurements and qualitative observations regarding several parameters of critical interest to direct illumination laser fusion. A 1.05 micron, 3.3 nsec driver beam was focused onto carbon foils in a large (0.7-1 mm diameter) spot to reduce edge effects. From images produced by a backlighting X-ray flash, we have measured overall coupling efficiency, smoothing of laser nonuniformities, target velocity, and ablation pressure. The high velocity targets maintain a localized, high density (> 3% of solid). In contrast to other workers' recent measurement of pressure from X-ray imaging, our X-radiographic results, including pressure, are in general agreement with earlier NRL studies. Our results

have also provided further insights into double foil interactions and planar target preheat measurements. Author (GRA)

N83-14481# TRW Defense and Space Systems Group, Redondo Beach, Calif.
DIRECTED BEAM ALIGNMENT SYSTEM TESTING PROGRAM Final Report, Dec. 1978 - Jun. 1979
Robert F. Gates 4 Jun. 1979 119 p refs
(Contract DAAK40-79-C-0018)
(AD-A119460; TRW-33556) Avail: NTIS HC A06/MF A01 CSCL 20/5

A technique has been developed for six-degree-or-freedom coordinate frame alignment between remote battlefield vehicles. It was developed specifically for a High Energy Laser Weapon application which must hand off a target from a radar vehicle to a laser vehicle to milliradian accuracy. Laboratory hardware was used from rooftops in Redondo Beach to validate the concept experimentally. In a field environment, an alignment should take less than 30 sec, work to ranges beyond 3 km, and work in visibilities less than 4 km. Author (GRA)

N83-14482# Philips Labs., Briarcliff Manor, New York.
DEVELOPMENT OF A NOVEL LASER MATERIAL FOR MINIATURIZED LASER SYSTEMS Final Technical Report, 8 Nov. 1980 - 31 Dec. 1981
Walter Zwicker and Sel Colak May 1982 51 p refs
(Contract MDA903-81-C-0034; DARPA-Order 4040)
(AD-A119457) Avail: NTIS HC A04/MF A01 CSCL 20/5

Single crystals of NdP5O14, NdLiP4O12, and NdAl3(BO3)4 were grown from various type of fluxes. Miniature laser rods up to 2 x 2 x 20 mm in size were fabricated from crystals of NdP5O14. The spectroscopic properties of these compounds are compared, and data are given of the lasing experiments with NdP5O14 on laser pulse energies, pulse shapes, and beam divergences at different repetition rates with and without Q-switching. Single-pulse output energies up to 240 mJ in the free-oscillation mode and up to 30 mJ in the Q-switched mode were obtained. Repetitive pulsed operation was possible at rates of 5-10 pps with forced gas cooling. Single crystals of (RE)P5O14, (RE)LiP4O12, and (RE)Al3(BO3)4 with Er(3+), as well as with Gd and Yb, were grown and studied spectroscopically. The data shows that these materials have Er(3+) luminescence properties similar to those of Er(3+) in other hosts which have shown lasing. Author (GRA)

N83-14483# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
PRODUCTION OF ELECTRONICALLY EXCITED Bi(2D3/2)
John M. Herbelin, Robert Giedt, and Henry A. Bixler 16 Aug. 1982 27 p refs
(Contract F04702-81-C-0082)
(AD-A119539; TR-0082(2930-01)-2; SD-TR-82-57) Avail: NTIS HC A03/MF A01 CSCL 20/5

Emission signals at 8758 A were observed when bismuth atom vapor was introduced into a supersonic flow of electronically excited nitrogen fluoride, NF(a singlet Delta). A correlation of thermal and pressure data with the appearance of the chemiluminescence, along with a computer analysis of the IRTV observations at two wavelengths, is presented. On the basis of an analysis of these data, it is concluded that the observed emission results from the production of an excited-state bismuth atom density, Bi(doublet D three halves), on the order of $>$ 10 to the 13th power atoms cm-3 by collisional transfer with NF(a singlet Delta). Author (GRA)

N83-14484# Westinghouse Research and Development Center, Pittsburgh, Pa.
EXCITATION OF MERCURIC BROMIDE BY ELECTRONS Final Report, 15 May 1981 - 30 Jun. 1982
P. J. Chantry and C. L. Chen 30 Aug. 1982 61 p refs
(Contract N00014-81-C-0518)
(AD-A119583; Rept-82-9C1-EXCIT-R1) Avail: NTIS HC A04/MF A01 CSCL 20/5

Computer modelling of the HgBr discharge laser requires as input the various cross sections for electron impact on HgBr2. One of the most important of these is the cross section for production of the HgBr* (B doublet sigma one-half), the upper laser state, by electron impact on HgBr2. This report describes work performed to measure the total emission cross section for production of the HgBr B-X fluorescence. Under the conditions of the experiment this corresponds to the total formation cross section for the HgBr*(B) state. A magnetically collimated electron beam (1-200 eV) crosses a low density molecular beam of HgBr2. The apparatus permits simultaneous measurements of negative ion, positive ion, and wavelength resolved photon production from HgBr2, and from permanent bottled gases. The relative wavelength dependence of the photon counting system has been determined from 280 to 640 nm using standard lamps. By comparison with known ionization and total emission cross sections in He, it is possible to measure total emission cross sections for other molecules whose ionization cross sections are known. The HgBr*(B) emission extends from 510 nm to beyond 350 nm, and appropriate integration over wavelength is necessary. The resulting cross section has a sharp onset at 6.0 eV and rises rapidly to a plateau with a mean value of 3.2 (-16) sq cm. In the region (3-5 eV) of dissociative attachment HgBr*(B) production is undetectable, corresponding to sigma $<$ (-18) sq cm. Author (GRA)

N83-14485# ITT Gilfillan, Inc., Van Nuys, Calif.
FREQUENCY SCANNING RADAR CONCEPTS FOR ARMY HIGH ENERGY LASER WEAPONS. VOLUME 1: HELVADS/FALW/FALW-D Final Report, Apr. 1981 - Feb. 1982
C. Barfield, D. Epps, and S. Howard Apr. 1982 129 p
(Contract DAAH01-81-C-A782)
(AD-A119536) Avail: NTIS HC A07/MF A01 CSCL 17/9

The data presented in this volume consists of concepts, design approaches, configurations and analyses with recommendations for frequency scanning radars compatible with the target acquisition subsystem requirements of the HELVADS, FALW and FALW-D weapon systems. In arriving at recommendations for the three subsystem requirements, a number of candidates were examined and reported on in the monthly progress reports. These candidate configurations for FSR's, with brief descriptions indicating the more important advantages, disadvantages and reasons for recommendation or non-recommendation have been included. In those instances where an overall acquisition subsystem group is shown as opposed to strictly FSR configurations, brief descriptive data for those elements other than FSR data was included, however, time and scope of effort limited data to the level necessary only to provide an understanding of the group concept. Author (GRA)

N83-14486# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.
HALS POST PROCESSING SOFTWARE DESIGN Final Report
H. J. Byrnes Sep. 1982 48 p refs Sponsored in part by Defense Mapping Agency
(AD-A119785; NORDA-TN-161) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report discusses software that was designed and developed to process Hydrographic Airborne Laser Sounder (HALS) data tapes. The HALS survey produces tapes containing navigational, heading, altitude, and various housekeeping information, as well as raw laser ranging data from which ocean depths are to be extracted in a post-mission processing mode. The software performs its tasks in four sequential processing passes. Pass 1 processing techniques are based on research results concerning depth measurement bias caused by light propagation in sea water. Pass 2 utilizes computer/operator interactive CRT display techniques for editing purposes and computes position via an interactive process using Sodano inverse formulas. Pass 3 utilizes optimal filter techniques to resolve aircraft altitude, pitch, roll, and sea surface waves via a minimum variance solution on the slant range laser measurement from aircraft to sea surface. Pass 4 also operates via optimal filter theory and is designed to treat both depth error and position error simultaneously. GRA

N83-14487# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.

PULSED DF CHAIN-LASER BREAKDOWN INDUCED BY MARITIME AEROSOLS

S. T. Arimoto, J. S. Whittier, F. G. Ronkowski, P. R. Valenzuela, and G. N. Harper 30 Aug. 1982 32 p refs Original document was announced as A82-31892

(Contract F04701-81-C-0082)

(AD-A119786; TR-0082(2720)-1; SD-TR-82-61) Avail: NTIS HC A03/MF A01 CSCL 20/5

Thresholds for breakdown induced by liquid and solid aerosols in room air have been measured for a 1 microsec-duration pulsed D2-F2 laser of 3.58 -4.78 micron bandwidth. The DF laser beam was directed into an aerosol chamber that simulated maritime atmospheres on the open sea. Both focus and collimated beams were studied. For a focused beam in which the largest encountered aerosol particles were of 1 to 4 micron diameter, pulsed DF breakdown thresholds were measured to lie in the range 0.6 to 1.8 GW/sq cm. Salt-water aerosol breakdown thresholds for micron-size particles were found to be 15 to 30% higher than the corresponding thresholds for fresh-water particles. For a collimated beam that encountered particle diameters as large as 100 microns, breakdown could not be induced using 0.5- microsec (FWHM) pulses at peak intensities of 59 MW/sq cm. Image converter camera measurements of the radial plasma growth rate of 1.3 cm/microsec (at 1.4 GW/sq cm) were consistent with measurements of the cutoff rate of the transmitted laser beam. Pulsed DF breakdown thresholds of 32 MW/sq cm for 30- micron diameter Al2O3 particles were also measured to permit comparison with the earlier pulsed-HF breakdown results of Lencioni, et al.; the solid-particle threshold measurements agree with the Lencioni data if one assumes that the thresholds for microsecond-duration pulses scales is 1/lambda. An approximate theoretical model of the water particle breakdown process is presented that permits the scaling of the present results to other laser pulse durations, aerosol distributions, and transmission path lengths. GRA

N83-14488# California Univ., Livermore. Lawrence Livermore Lab.

CHARACTERIZATION OF LASER PULSES USED IN MEASUREMENTS OF OPTICAL PROPERTIES IN LASER MATERIALS

David Milam 14 Oct. 1981 8 p refs Presented at the Interagency Mech. Operations Group Subgroup Meeting, Livermore, Calif., 15 Oct. 1981

(Contract W-7405-eng-48)

(DE82-003181; UCRL-86787; CONF-8110110-1) Avail: NTIS HC A02/MF A01

Diagnostic techniques for characterizing the short-duration 1064-nm laser pulses used for measuring thresholds for laser-induced damage, nonlinear refractive indices, and amplifier saturation fluences are reviewed. Each of these experiments requires determination of the absolute flux in W/sq cm, F(x, y, t), passing through a plane, or of the absolute integrated fluence in J/sq cm, J(x, y), deposited in a plane. To measure flux or fluence in a plane, the laser beam is divided to form several equivalent planes in diagnostic beams. In these equivalent planes, photographic plates or vidicons are used to record the spatial profile of the beam, J(x, y), calorimeters to measure the pulse energy, E, and either streak cameras or oscilloscope/diode combinations to measure the pulse waveform, F(x, y, t). Then by numerical analysis two integrals are solved to determine normalization factors. DOE

N83-14489# Commissariat a l'Energie Atomique, Villeneuve-Saint-Georges (France). Centre d'Etudes de Limeil.

ULTRA RAPID CINEMATOGRAPHY IN THE X-RAY SPECTRAL RANGE FOR LASER-MATTER INTERACTIONS EXPERIMENTS

C. Cavailler, N. Fleurot, M. Rostaing, and R. Sauneuf May 1981 18 p refs In FRENCH Presented at the 1st European Conf. on Cineradiography with Photons or Particles, Paris, 19-21 May 1981

(DE81-700579; CEA-CONF-5732; CONF-810540-4) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The dynamic recording of the phenomena occurring in the plasma created while the target is irradiated is discussed. Analysis in the X-ray spectral region, and in particular initially in the 1 to 10 KeV region is useful for studying the self emission of plasmas or for carrying out radiography with an auxiliary X-ray source. Different detectors were developed enabling the spatiotemporal evolution of these X-ray emissions to be determined with a resolution in the picosecond range. These detectors also enable two dimensional images of the plasma to be visualized with exposure times of less than 300 ps. The successive stages which allowed these objectives to be fulfilled are described. Both the temporal and spatial are important. GRA

N83-14490# California Univ., Livermore. Lawrence Livermore Lab.

LASER-LIGHT-ABSORPTION STUDIES AT 1.06 MICRON, 0.53 MICRON AND 0.35 MICRON WAVELENGTHS

F. Ze, E. M. Campbell, R. E. Turner, V. Rupert, K. Manes, D. Phillion, G. Hermes, S. Hildum, P. Lee, G. Tirsell et al Oct. 1981 18 p ref Presented at the 23rd Ann. Meeting of the Div. of Plasma Phys. of the APS, New York, 12-16 Oct. 1981

(Contract W-7405-eng-48)

(DE82-003168; UCRL-86414; CONF-811028-5) Avail: NTIS HC A02/MF A01

Results are presented of light absorption in a series of wavelength scaling experiments recently completed at LLNL. The Argus facility was used to do target studies at 1.06 micrometers, 0.53 micrometers and 0.35 micrometers. Box calorimeter scattered light measurements implied greatly improve laser light absorption for both high Z and low Z plasmas at laser wavelengths shorter than 1.06 micrometers. Furthermore, at the 0.35 micrometers laser wavelength, the inferred absorption is nearly 100% over a substantial range of incident laser intensities. Our results further show a dramatic decrease in the stimulated Brillouin scattered light at 0.35 micrometer relative to the values at 1.0 micrometers and 0.53 micrometers. DOE

N83-14491# Los Alamos Scientific Lab., N. Mex.

STATUS OF CO2-LASER FUSION

S. D. Rockwood 1981 24 p Presented at the AVS Natl. Meeting, Anaheim, Calif., 2-6 Nov. 1981

(Contract W-7405-eng-36)

(DE82-004334; LA-UR-81-3330; CONF-811113-37) Avail: NTIS HC A02/MF A01

Some experiments being conducted to demonstrate the scientific feasibility of the thermonuclear burn of small fuel masses (< 1 mg) are described. The major items of interest in inertial confinement fusion target physics discussed include the stability of implosions, energy transport, and ignition criteria. A.R.H.

N83-14950# Ecodynamics Research Associates, Inc., Albuquerque, N. Mex.

INTERACTIVE DESIGN OF LASER ELECTRODES USING ELLIPTIC GRID GENERATION AND SEMIDIRECT/MARCHING METHODS

Patrick J. Roache *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 593-603 refs (For primary document see N83-14930 05-59)

Avail: NTIS HC A99/MF A01 CSCL 20/5

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N83-14492 California Univ., Davis.

A NONLINEAR FINITE ELEMENT ANALYSIS OF ELASTOMERIC BEARINGS Ph.D. Thesis

Joel Kimbrough Moore 1982 119 p

Avail: Univ. Microfilms Order No. DA8220149

A nonlinear, large displacement, large deformation finite element analysis is developed for a rubber and steel composite elastomeric bearing. A mixed variational analysis procedure is developed for plane strain using separate variables to describe the displacement and the volume change. The results using this mixed approach are compared to results obtained from an analysis

procedure based upon minimum potential energy. A Lagrangian description of the large deformations in terms of the Green strain tensor referred to the initial undeformed coordinates is used to formulate the problem. A nine node Lagrangian element with straight sides and a linear approximation for the volume change are used to obtain the governing nonlinear finite element equations. Newton's method is utilized to solve these nonlinear equations. Several sample solutions are included to demonstrate the solution procedure and the resulting deformations and stresses are presented. Dissert. Abstr.

N83-14493*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

AUTOMATIC WELD TORCH GUIDANCE CONTROL SYSTEM

H. E. Smaith, W. A. Wall, and M. R. Burns, Jr. Nov. 1982 24 p refs

(NASA-TM-82503; NAS 1.15:82503) Avail: NTIS HC A02/MF A01 CSCL 13I

A highly reliable, fully digital, closed circuit television optical, type automatic weld seam tracking control system was developed. This automatic tracking equipment is used to reduce weld tooling costs and increase overall automatic welding reliability. The system utilizes a charge injection device digital camera which as 60, 512 inidividual pixels as the light sensing elements. Through conventional scanning means, each pixel in the focal plane is sequentially scanned, the light level signal digitized, and an 8-bit word transmitted to scratch pad memory. From memory, the microprocessor performs an analysis of the digital signal and computes the tracking error. Lastly, the corrective signal is transmitted to a cross seam actuator digital drive motor controller to complete the closed loop, feedback, tracking system. This weld seam tracking control system is capable of a tracking accuracy of + or - 0.2 mm, or better. As configured, the system is applicable to square butt, V-groove, and lap joint weldments. S.L.

N83-14494*# Massachusetts Inst. of Tech., Cambridge. National Magnet Lab.

MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MWE POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT (CDER) SUPPLEMENT. MAGNET SYSTEM SPECIAL INVESTIGATIONS Final Report

Sep. 1981 86 p

(Grant NAG3-100; Contract DE-AI01-77ET-10769)

(NASA-CR-165509; DOE/NASA/0100-1; NAS 1.26:165509; NAS-E-1) Avail: NTIS HC A05/MF A01 CSCL 10A

The results of magnet system special investigations listed below are summarized: 4 Tesla Magnet Alternate Design Study; 6 Tesla Magnet Manufacturability Study. The conceptual design for a 4 Tesla superconducting magnet system for use with an alternate (supersonic) ETF power train is described, and estimated schedule and cost are identified. The magnet design is scaled from the ETF 6 T Tesla design. Results of a manufacturability study and a revised schedule and cost estimate for the ETF 6 T magnet are reported. Both investigations are extensions of the conceptual design of a 6 T magnet system performed earlier as a part of the overall MED-ETF conceptual design described in Conceptual Design Engineering Report (CDER) Vol. V, System Design Description (SDD) 503 dated September, 1981, DOE/NASA/0224-1; NASA CR-165/52. Author

N83-14495# National Center for Resource Recovery, Washington, D. C.

INVESTIGATION OF ENGINEERING AND DESIGN CONSIDERATIONS IN SELECTING CONVEYORS FOR DENSIFIED REFUSE-DERIVED FUEL (DRDF) AND DRDF: COAL MIXTURES Final Report, Jun. 1980 - Sep. 1981

Zahid Kahn, Marc L. Renard, and Jay Campbell Tyndall AFB, Fla. AFESC Aug. 1981 129 p refs

(Contract MIPR-N-80-33; Grant EPA-R-806709; AF Proj. 2054)

(AD-A119065; AFESC/ESL-TR-81-58) Avail: NTIS HC A07/MF A01 CSCL 13/3

An engineering evaluation and experimental program involving several types of conveyors applied to blends of densified refuse-derived fuel (dRDF) and blends of dRDF and coal, was conducted by the National Center for Resource Recovery. The final project report discusses the properties of waste affecting convey ability and presents experimentally determined values or observed characteristics. A procedure was selected for the assessment, selection, and operation of belt conveyors based on spillage rate. Corroborating experimental results from a recirculating test rig operated with samples of dRDF and a blend of dRDF and coal over a range of belt configurations, velocities and flow rates were also presented. Experiments conducted on a vibrating pan conveyor over a range of frequencies and stroke length, and on a small apron conveyor, were described and the test results analyzed. Author (GRA)

N83-14496# Naval Ship Research and Development Center, Bethesda, Md.

THE FRICTION AND WEAR OF COPPER IN HIGH-LOAD, LOW-SPEED, SMALL-AMPLITUDE RECIPROCATING SLIDING Research and Development Report, Oct. 1980 - Jun. 1982

Sidney A. Karpe Aug. 1982 107 p refs

(AD-A119499; DTNSRDC-82/048) Avail: NTIS HC A06/MF A01 CSCL 11/6

There is a critical need that the mechanisms of wear in marine components sliding under marginally-lubricated conditions be elucidated. These conditions were simulated in a tribotester that was operated under conditions of high nominal pressure, low speed, and small-amplitude reciprocating sliding. High purity (99.9%) copper was selected as the rubbing member because of its relatively simple microstructure and its widespread use as a base metal in many bearing alloys. The friction and wear of this metal, rubbing against various counterfaces in 'inert' mineral oil, were determined. Topographical changes and subsurface deformation structures produced by sliding were determined. The investigation produced information on the following: the influence of topographical changes on the coefficient of friction (or frictional force); the dependence of the depth of deformation on the coefficient of friction; the mechanism of wear particle formation; and the relationship between wear and the coefficient of friction. The results also suggested that the topographical changes produced by sliding may be more important than the properties of the material itself in determining wear resistance. Author (GRA)

N83-14497# Naval Air Engineering Center, Lakehurst, N.J. Support Equipment Engineering Dept.

WEAR DEBRIS ANALYSIS OF GREASE LUBRICATED BALL BEARINGS Final Technical Report

Alan S. Maciejewski and J. W. Rosenlieb (SKF Industries) 12 Apr. 1982 100 p refs

(Contract N68335-77-C-0584; WF53537401)

(AD-A119470; NAEC-92-152) Avail: NTIS HC A05/MF A01 CSCL 11/9

An investigation was conducted to experimentally determine the wear surface condition of grease-lubricated ball bearings, by monitoring the wear debris retained in the grease. Testing of six bearings was performed on endurance test machines with grease sample removal. Visual and scanning electron microscope examinations of the bearing surfaces were performed per an established schedule by SKF. Respective grease samples were treated, analyzed, and correlated by NAVAIRENGCEN. A total of four bearings failed during the testing while the remaining two bearings reached time up. The testing, therefore, provided a good distribution of failed and unfailed bearings from which the evaluation of bearing failure or imminent failure detection by wear debris analysis could be established. The results of the wear debris analysis, performed by NAVAIRENGCEN compared to the physical examination of the bearings performed by SKF, showed a good correlation, in terms of monitoring the wear state/condition of the bearings throughout their life. As it appears presently, this analysis technique is best suited to the examination of used grease obtained from dismantled grease lubricated components or in design applications. Author (GRA)

N83-14498# Oak Ridge National Lab., Tenn.
EXAMINATION OF PACKLESS, BELLOWS-TYPE VALVES IN THE THORS FACILITY
R. L. Ludwig and B. H. Montgromery 1981 17 p refs
(Contract W-7405-eng-26)
(DE82-003528; ORNL/TM-8028) Avail: NTIS HC A02/MF A01

Sixty-two packless, bellow type, 1/2 inch IPS valves were removed. Three valves were examined to determine whether the valves could be salvaged. Each valve was cleaned, leak checked and prepared for metallographic examination. From these tests, two of the valves' bellows, made of 316 stainless steel, showed signs of sensitization, and one also contained enlarged grain boundaries. It was concluded that the sensitization is not extensive enough to preclude reuse. The appearance of the sulfur grain boundary phase is an isolated occurrence. The valves are recommended for reuse in noncritical locations. DOE

N83-14499# Oak Ridge National Lab., Tenn.
FOSSIL-ENERGY WELDING SUPPORT AND DEVELOPMENT PROGRAM
R. A. Bradley, G. M. Goodwin, and D. P. Edmonds 1981 5 p refs Presented at the 6th Ann. Conf. on Materials for Coal Conversion and Utilization, Gaithersburg, Md., 13 Oct. 1981
(Contract W-7405-eng-26)
(DE82-001461; CONF-811061-2) Avail: NTIS HC A02/MF A01

Stainless steel clads were prepared using SA wire and strip cladding, and include the following materials: types 309, 310 LMo, and 320 stainless steel; NiCrMo-3; and four nonstandard compositions. Specimens taken from these clads have been exposed in the bottom of the Wilsonville, Alabama, solvent-refined coal (SRC) dissolver vessel for about six months and are presently being evaluated. The weld was made in the downhand (1G) position and consists of about 200 passes. Hardness does not vary significantly through the thickness of the plate and is 95 Rockwell B average. This indicates that no significant variations in tensile strength through the thickness of the plate should exist. Similar conclusions about toughness cannot be drawn since toughness cannot always be related to hardness. There is significant variation in the microhardness of the weld metal and heat affected zone, however. This indicates significant variations in properties throughout the weldment and makes it difficult to draw any meaningful conclusions from mechanical properties data from any one point in the metal or heat-affected zone. DOE

N83-14500# Centre Technique des Industries Mecaniques, Senlis (France).
USER'S MANUAL OF COMPUTERIZED FILE OF THE WELDING OPERATING MODES Final Report [GUIDE D'UTILISATION DU FICHIER INFORMATISE DES MODES OPERATOIRES DE SOUDAGE]
I. S. Eliot (Inst. of Soudre) 2 Jul. 1982 52 p refs In FRENCH Sponsored by Inst. de Soudure
(CETIM-12-Y-421) Avail: NTIS HC A04/MF A01

A computerized file of practical industrial welding procedures based on a choice of 15 retrieval parameters is described. Each parameter is explained in order to facilitate the question form completion by the user. The parameters include type of material, width, shape, surface treatment, geometrical configuration, joint position and means available. The information includes type of welding material, welding procedure, number and position of passes, welding position, electrical parameters, thermal parameters and material pretreatment. Author (ESA)

N83-14501# Centre Technique des Industries Mecaniques, Senlis (France).
MODELING OF A FLUID COUPLER
M. Garcin Aug. 1982 39 p refs In FRENCH
(CETIM-14-A-342) Avail: NTIS HC A03/MF A01

A mathematical model describing quantitatively the torque and speed fluctuations transmitted to the outlet of a hydraulic coupler is presented. The coupler is implemented by a centrifugal pump rotor and a turbine rotor both presenting a half toroid shape and the same geometrical axis. The theoretical and experimental torque values as a function of the rotation speed and slipping show excellent agreement. A transfer matrix describing the relationship between inlet and outlet torque and speed fluctuations is given and the experimental facilities for testing the model are described. A vibration attenuation of more then 6 db per octave at frequencies above 10% the pump rotation are demonstrated and experimentally by verified. Author (ESA)

N83-14502# United Kingdom Atomic Energy Authority, Harwell (England). Metallurgy Div.
DEFECTS ARISING FROM WELDING AND CLADDING PWR PRESSURE VESSEL STEELS: A REVIEW
S. G. Druce and J. A. Hudson Feb. 1982 52 p refs
(AERE-R-10418) Avail: NTIS HC A04/MF A01

The occurrence of defect, resulting from structural welding and cladding of post weld reheat pressure vessels is reviewed and the cracking mechanisms involved are discussed with respect to material composition and fabrication procedure. Material specifications and procedures to minimize susceptibility to defect formation are described. Reported defects associated with structural welding include liquation cracking and hydrogen, cracking which are manifest before post weld heat treatment (PWHT) and reheat (or stress relief) cracking which occurs during PWHT. Cracks were detected only in the heat affected zones of welds in the case of PWR pressure vessels and all forms of cracking are more pronounced in areas of segregation in the steel where impurity and inclusion contents are locally larger than the bulk values. Liquation cracks occur up to a few mm in size along grain boundaries weakened by the presence of low melting point material resulting from a relatively high concentration of certain impurities. There are also few indications of small cracks due to hydrogen cracking, in association with liquation cracks. Author

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N83-14503# Analytics, Inc., Bloomington, Ind.
A MODEL OF EDDY-CURRENT PROBES WITH FERRITE CORES Final Report
Harold A. Sabbagh 19 Apr. 1982 58 p refs
(Contract N60921-81-C-0076)
(AD-A118865; TR-1-82) Avail: NTIS HC A04/MF A01 CSCL 14/2

We developed a model of a three dimensional axisymmetric probe coil with a ferrite core in the presence of a conducting half-space (the workpiece). The half-space is accounted for by computing the appropriate Green's function by using Bessel transforms. Upon introducing equivalent Amperian currents within the core, we derive a volume integral equation, whose unknown is either the magnetic induction field, or induced magnetization, and whose kernel is the Green's function that was previously derived. The integral equation is transformed, via the method of moments, into a vector-matrix equation, which is then solved using a linear equation solver. This allows us to compute the magnetic induction field within the core, the driving-point impedance of the coil/core combination, and the induced eddy-currents within the workpiece. Results of these calculations are presented; in addition, a brief description of extensions of the model to linear and nonlinear pulsed eddy-current problems, with anisotropic cores, and optimization of core shaping to provide specific eddy-current flow patterns is given. GRA

N83-14504# Commission of the European Communities, Ispra (Italy). Joint Research Centre.
ANALYSIS OF COMPLETE LOGICAL STRUCTURES IN SYSTEM RELIABILITY ASSESSMENT
A. Amendola, C. A. Clarotti, S. Contini, and F. Spizzichino 1980 85 p refs

(DE81-700740; ERU-6886) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

The application field of the fault tree techniques was explored to assess whether the AND-OR structures covered all possible actual binary systems. This resulted in the identification of various situations requiring the complete AND OR NOT structures for their analysis. Different examples of complete fault trees, which can be examined according to different degrees of approximation are presented. Two different methods of logical analysis that permit the reduction of complete fault trees to AND-OR structures are shown. The problems concerning the evaluation of the probability distribution of the time to first top event occurrence, once the hypothesis of structure function monotonicity is removed is discussed. DOE

N83-14505# Sandia Labs., Albuquerque, N. Mex.

HOW TO CHEAT A MONTE CARLO ESTIMATION OF A SYSTEM'S RELIABILITY

Carl Diegert and Kathleen V. Diegert 1981 10 p refs Presented at a DOE Statistical Symp., Upton, N.Y., 6 Nov. 1981

(Contract DE-AC04-76DP-00789)

(DE82-002443; SAND-81-1381C; CONF-811136-1) Avail: NTIS HC A02/MF A01

The probability of a system failure is investigated. Monte Carlo techniques are used for probabilistic networks with unequal component reliabilities. S.L.

N83-14506# Sandia Labs., Albuquerque, N. Mex. Quality Assurance Advanced Planning Div.

QUALITY ASSURANCE AT SANDIA NATIONAL LABORATORIES

Cheryl K. Haaker Oct. 1981 27 p

(Contract DE-AC04-76DP-00789)

(DE82-004502; SAND-81-1531) Avail: NTIS HC A03/MF A01

From experience gained in the weapons program, Sandia developed effective methods to guarantee high reliability in sophisticated components which must continue to be functionable in extremely adverse environments after long unattended periods of time. Weapons experience required that Sandia devise test activities that are adequate to detect virtually any possible type of defect that could develop in a nuclear weapon, while neither setting off actual nuclear explosions nor expending excessive amounts of valuable hardware in destructive testing. This learning experience contributed to Sandia's QA expertise, which is now finding application in such diverse areas as research into renewable energy sources (solar photovoltaics, wind turbines, solar collectors), studies of ways to improve nuclear reactor safety, and verifying the reliability of power supplies for NASA's space probes. DOE

N83-14507# Deutsche Gesellschaft fuer Zerstoerungsfrie Pruefung e.V., Berlin (West Germany).

SUMMARIES OF THE LECTURES OF A CONFERENCE ON NONDESTRUCTIVE TESTING

1980 64 p In GERMAN Presented at the 1980 Ann. Meeting of the Deutsche Gesellschaft fuer Zerstoerungstreie Pruefung e.V., Goettingen, West Germany, 12 May 1980

(INIS-MF-6280) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The lectures were held at the German organization for nondestructive testing (DGZfP) conference on nondestructive testing in May 1980 in Goettingen are summarized. The lectures dealt with ultrasonic methods, electromagnetic methods and applications of X-, gamma and neutron rays in nondestructive testing. Quality assurance, economics and problems of the training of testing personnel are discussed. DOE

N83-14508# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.

ADVANCED ULTRASONIC TEST TECHNIQUES [TECHNICHE AVANZATE DI ESAMI CON ULTRASUONI]

F. Tonolini 1982 16 p In ITALIAN Presented at Corso di Aggiornamento sulle Tech. di Esame non Distruttive, Turin, 21 Apr. 1982

(CISE-1796) Avail: NTIS HC A02/MF A01

The detection of material defects, using ultrasonic beams in nondestructive tests, is discussed. The fundamentals of the mathematical models, relating the shape of the defect to the ultrasonic echo frequency spectrum, are reviewed. Technologies, using movable ultrasonic sensors and the corresponding signal processing equipment, are described. Several visualization methods, including acoustic holography and acoustic scanning, are explained. The use of multisensor arrays to produce defect images without sensor displacement is also described.

Author (ESA)

N83-14509# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.

ACOUSTIC EMISSION [EMISSIONE ACUSTICA]

F. Tonolini 1982 10 p In ITALIAN Presented at Corso di Aggiornamento sulle Tech. di Esame non Distruttivo, Turin, 21 Apr. 1982

(CISE-1797) Avail: NTIS HC A02/MF A01

Acoustic emission nondestructive test procedures, the equipment to implement the techniques, and the applications of these tests to monitoring and control are described. The acoustic emissions produced by fluid leaks, microstructural events, friction, shock and other sources are examined. The instrumentation includes a minicomputer for real time data processing. The main result of the analysis is source localization. Industrial applications such as on-line weld control and continuous equipment monitoring are mentioned. Author (ESA)

N83-14510# Centre Technique des Industries Mecaniques, Senlis (France).

ACOUSTIC EMISSION WELDING CONTROL: CHARACTERIZATION OF THE ACOUSTIC EMISSION DURING NO-DEFECT WELDING [CONTROLE DU SOUDAGE PAR EMISSION ACOUSTIQUE: CARACTERISTIQUES DE L'EMISSION ACOUSTIQUE OBTENUE EN COURS DE SOUDAGE SANS CREATION DES DEFAUTS]

M. Nogues and J. Roget Jun. 1982 46 p refs In FRENCH Proposed for presentation at AFIAP, Oct. 1983 Sponsored by CEA and Inst. de Soudure 2 Vol.

(CETIM-15-Y-121-Vol-1) Avail: NTIS HC A03/MF A01

A multipass no-defect weld using electrical conducting flux joining two 31 mm width plates at a 17 deg angle was tested using 4 acoustic transducers placed on waveguides welded to the plates and a fifth transducer placed directly on the plate. The welding parameters tested include the reproducibility between passes, the nature of the welding materials and welding energy. The spectra and the space-time distribution of the acoustic emissions were analyzed. Welding energy is the key parameter determining the acoustic emissions during welding, while the nature of the flux determines the emissions after welding. It is shown that peak amplitude distribution and space-time analysis are the most convenient approachs to defect detection. Author (ESA)

N83-14511# Centre Technique des Industries Mecaniques, Senlis (France).

ACOUSTIC EMISSION CONTROL OF MULTIPASS WELDING DURING ITS EXECUTION: SUMMARY OF THE RESULTS OBTAINED IN THE FIRST PART OF THE PROGRAM [CONTROLE PAR EMISSION ACOUSTIQUE DES SOUDAGES MULTIPASSES AU COURS DE LEUR EXECUTION: SYNTHESE DES RESULTATS OBTENUS DE LA PREMIERE PHASE DE LA RECHERCHE]

J. Roget Jul. 1982 17 p refs In FRENCH Sponsored by Delegation Generale a la Recherche Scientifique et Technique

(CETIM-15-Y-121-Vol-5) Avail: NTIS HC A02/MF A01

A critical analysis of the bibliography was conducted, the characteristics of the acoustic emission of the cooling welding flux were determined, and a first reference no-defect weld was experimentally produced and tested. The literature shows that the characterization of the background noise and a space-time treatment of the acoustic data are key subjects for the study. Experimental testing of the acoustic emissions of the UM89 flux

cooling shows that the emissions are temperature dependent affected by the differences in dilatation coefficients and the oxydation in the base metal, and only quantitatively dependant on the cooling speed. The influence of several parameters on a no-defect reference weld was measured, revealing that weld energy is the most important parameter regarding acoustic emission.
Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N83-14512# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 14, NO. 10 Monthly Report
Judith Nagle-Eshleman, ed. Oct. 1982 102 p refs
(AD-A120615) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Literature reviews on aeroacoustics, elastodynamics, and the dynamics of composite and sandwich plates are presented. For individual titles, see N83-14513 through N83-14515.

N83-14513# Minnesota Univ., Minneapolis.
COHERENT STRUCTURE AND JET NOISE c71
R. E. A. Arndt and D. F. Long *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 10 Oct. 1982 p 3-10 refs (For primary document see N83-14512 05-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

Aeroacoustics research into the existence of coherent structures in turbulent flow and their possible influence in the radiation of sound is reviewed. Methods that might lead to meaningful understanding of the physics of turbulence are discussed. J.D.

N83-14514# General Dynamics Corp., Groton, Conn. Electric Boat Div.
BEHAVIOR OF ELASTOMERIC MATERIALS UNDER DYNAMIC LOADS, 3
E. C. Hobaica *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 10 Oct. 1982 p 13-16 refs (For primary document see N83-14512 05-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

Literature published since 1979 on the behavior of rubber materials under small amplitude, sinusoidal forces is reviewed. Advances in the field in the past three years were most significant when applied to the field of damping. Author

N83-14515# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
RESEARCH ON DYNAMICS OF COMPOSITE AND SANDWICH PLATES, 1979 - 1981 c24
C. W. Bert *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 10 Oct. 1982 p 17-34 refs Document also announced as N82-33441 (For primary document see N83-14512 05-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

The literature concerning dynamics of plate type structural elements of either composite material or sandwich construction is surveyed. Papers from mid-1979 through early 1982 are reviewed. Particular attention is given to experimental research and to linear and nonlinear analysis. Configurations include rectangularly orthotropic, cylindrically orthotropic, and anisotropic plates; laminated plates; and thick and sandwich plates. Free and forced vibration, flutter, and impact are considered. Author

N83-14516 Rensselaer Polytechnic Inst., Troy, N. Y.
A FINITE ELEMENT TIME INTEGRATION METHOD FOR THE THEORY OF VISCOPLASTICITY BASED ON INFINITESIMAL TOTAL STRAIN AND OVERSTRESS Ph.D. Thesis
Robert Michael Zirin 1982 116 p Previously announced in AIAA as A82-33715
Avail: Univ. Microfilms Order No. DA8223341
For abstract see A82-33715.

N83-14517 Clarkson Coll. of Technology, Potsdam, N.Y.
THE STUDY OF DYNAMIC FRACTURE PROBLEMS USING FINITE ELEMENT METHOD Ph.D. Thesis
Kwong-Wing Chan 1982 184 p
Avail: Univ. Microfilms Order No. DA8220244

Numerical methods for determining stress intensity factors for elastodynamic crack problems in finite bodies of arbitrary shapes are presented, wherein linear elastic material behavior and two dimensional conditions prevail. Problems of plane stress and plane strain are solved by using singular quarter point isoparametric elements. The present computer programs are capable of solving three different problems: (1) determination of Model 1 stress intensity factors for problems of static crack extension; (2) determination of dynamic stress intensity factors or a linear elastic strip subjected to impact loading; (3) determination of dynamic stress intensity factors of a linear elastic strip containing a running crack subjected to either static or impact loading. For computational economy, the finite element mesh is generated by the program. Both lumped and consistent mass formulation are included for the sake of completeness. Dissert. Abstr.

N83-14518 Cornell Univ., Ithaca, N. Y.
LARGE DISPLACEMENT, INTERACTIVE-ADAPTIVE DYNAMIC ANALYSIS OF FRAMES Ph.D. Thesis
Marcelo Gattass 1982 328 p
Avail: Univ. Microfilms Order No. DA82119312

The updated Lagrangian formulation for two-dimensional beam-column elements was investigated. The continuum mechanics background of the method, the physical interpretation of the discretized matrices, the use of natural modes, the use of convected systems, and the representation of curved elements are investigated. Two beam column elements and a convected formulation are proposed. A force recovery process is formalized, and a new manifestation of the natural approach is presented. Computer aided structural analysis of buildings and frames with 32-bit, virtual memory minicomputers and vector refresh graphics terminals was studied. Aspects of building models, computational strategies, numerical algorithms and graphical techniques are discussed in relation to static and dynamic, linear and geometrically nonlinear, batch and interactive-adaptive analysis of two and three dimensional frames. A procedure to model three dimensional building is proposed, and interactive adaptive techniques with real time computer graphics for both practical large displacement analysis and computational mechanics research are presented.
Dissert. Abstr.

N83-14519 Illinois Univ., Chicago.
MATERIAL NONLINEAR ANALYSIS OF 3-D AND AXISYMMETRIC STRUCTURES (UNDER ARBITRARY LOADS) USING HYBRID STRESS FINITE ELEMENTS Ph.D. Thesis
Som Pal Singh 1982 182 p
Avail: Univ. Microfilms Order No. DA8220025

The hybrid stress finite element model is used to develop a 20-node, isoparametric, quadratic displacement three dimensional element designated as SH69Q. Linear elastic, elasto-plastic, viscoplastics and creep analyses of three dimensional and axisymmetric structures subject to arbitrary loads are considered. A hybrid stress based initial-stress formulation is presented for elastoplastic analysis of 3-D structures. The semi-analytic technique of linear analysis is extended to elastoplastic, visco-plastic and creep analysis of axisymmetric structures subject to arbitrary loads. Agreement is observed between two solutions along with savings in computational effort and time through semianalytic approach in elastoplastic and viscoplastic problems. In creep analysis semian-

alytic solution is found to be of inferior accuracy to the 3-D (SH69Q) solution. Dissert. Abstr.

N83-14520 Iowa Univ., Iowa City.
THREE DIMENSIONAL RIGID BODY DYNAMICS USING EULER PARAMETERS AND ITS APPLICATION TO STRUCTURAL COLLAPSE MECHANISMS Ph.D. Thesis
In Soo Chung 1982 145 p
Avail: Univ. Microfilms Order No. DA8222220

A computer-based method is presented for formulation and efficient solution of nonlinear, constrained differential equations of motion for spatial dynamic analysis of mechanical systems and its application to plastically deformable structures. Nonlinear holonomic constraint equations and differential equations of motion are written in terms of maximal set of Cartesian generalized coordinates. There are three translational and four rotational coordinates for each rigid body in the system, where the rotational coordinates are Euler parameters. Euler parameters have no critical singular cases, in contrast to Euler angles or any other set of three rotational generalized coordinates. The maximal set of generalized coordinates facilitates the general formulation of constraints and forcing functions. A numerical integration algorithm integrates the reduced system of differential equations of motion for only independent generalized coordinates, which are constructed by the generalized coordinate partitioning scheme. Several examples show validity of the formulation and accuracy of the program. Dissert. Abstr.

N83-14521*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CORRELATION AND ASSESSMENT OF STRUCTURAL AIRPLANE CRASH DATA WITH FLIGHT PARAMETERS AT IMPACT
Huey D. Carden Nov. 1982 44 p refs
(NASA-TP-2083; L-15431; NAS 1.60:2083) Avail: NTIS HC A03/MF A01 CSCL 20K

Crash deceleration pulse data from a crash dynamics program on general aviation airplanes and from transport crash data were analyzed. Structural airplane crash data and flight parameters at impact were correlated. Uncoupled equations for the normal and longitudinal floor impulses in the cabin area of the airplane were derived, and analytical expressions for structural crushing during impact and horizontal slide out were also determined. Agreement was found between experimental and analytical data for general aviation and transport airplanes over a relatively wide range of impact parameter. Two possible applications of the impulse data are presented: a postcrash evaluation of crash test parameters and an assumed crash scenario. E.A.K.

N83-14522# Materials Research Labs., Melbourne (Australia).
RESIDUAL STRESSES IN SWAGE-AUTOFRETTAGED THICK-WALLED CYLINDERS
Graham Clark 1982 30 p refs
(MLR-R-847) Avail: NTIS HC A03/MF A01

Autofrettage of thick-walled pressure vessels involves permanent expansion of the cylinder bore using hydraulic pressure or an oversize swage, and is used to increase the elastic strength of the cylinder. The beneficial residual stresses which produce this effect also retard the growth of fatigue cracks which may form at the bore surface on cyclic pressurization, and are therefore of major importance in determining the life of the cylinders which are fatigue-limited in operation. Residual stress distributions and cylinder expansions for swage autofretting of a large caliber gun barrel forging are predicted and evaluated by comparing them with experimental residual stress determinations. S.L.

N83-14523*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASUREMENTS OF SELF-EXCITED ROTOR-BLADE VIBRATIONS USING OPTICAL DISPACEMENTS
A. P. Kurkov 1982 13 p refs Proposed for presentation at the 28th Ann. Intern. Gas Turbine Conf., Phoenix, Ariz., 27-31 Mar. 1983
(NASA-TM-82953; E-1368; NAS 1.15:82953) Avail: NTIS HC A02/MF A01 CSCL 20K

The characteristics of optical displacement spectra and their role of monitoring rotor blade vibrations are discussed. During the operation of a turbofan engine at part speed, near stall, and elevated inlet pressure and temperature, several vibratory instabilities were excited simultaneously on the first fan rotor. The torsional and bending contributions to the main flutter mode were resolved by using casing-mounted optical displacement sensors. Other instabilities in the blade deflection spectra were identified. E.A.K.

N83-14524*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CYCLIC DEBONDING OF ADHESIVELY BONDED COMPOSITES
S. Mall, W. S. Johnson, and R. A. Everett, Jr. Nov. 1982 21 p refs Presented at the Intern. Symp. on Adhesive Joints: Their Formation Characteristics, and Testing, Kansas City, Mo., 12-17 Sep. 1982 Submitted for publication
(NASA-TM-84577; NAS 1.15:84577) Avail: NTIS HC A02/MF A01 CSCL 20K

The fatigue behavior of a simple composite to composite bonded joint was analyzed. The cracked lap shear specimen subjected to constant amplitude cyclic loading was studied. Two specimen geometries were tested for each bonded system: (1) a strap adherend of 16 plies bonded to a lap adherend of 8 plies; and (2) a strap adherend of 8 plies bonded to a lap adherend of 16 plies. In all specimens the fatigue failure was in the form of cyclic debonding with some 0 deg fiber pull off from the strap adherend. The debond always grew in the region of adhesive that had the highest mode (peel) loading and that region was close to the adhesive strap interface. E.A.K.

N83-14525# Systems Research Labs., Inc., Dayton, Ohio. Research Applications Div.
MECHANISMS OF DUCTILITY AND FRACTURE IN HIGH-TEMPERATURE MATERIALS Final Technical Report, 3 Apr. 1978 - 1 Aug. 1981
M. G. Mendiratta, Tai-Il Mah, and D. K. Chattergee Wright-Patterson AFB, Ohio AFWAL Jun. 1982 94 p refs
(Contract F33615-78-C-5037; AF Proj. 2306)
(AD-A118946; SRL-6985; AFWAL-TR-82-4061) Avail: NTIS HC A05/MF A01 CSCL 11/2

Significant improvements in the performance of current gas-turbine engines are possible through the use of higher operating temperatures and lower-density structural materials. Currently used alloys based upon titanium, iron, nickel, and cobalt are rapidly approaching their developmental limit in terms of achieving increased temperature capabilities; therefore, efforts have been made to develop new classes of materials. The dual objective of higher operating temperatures and lower-density materials has prompted research efforts toward the development of ceramics and intermetallics, many of which exhibit low density, high strength, and inertness up to high temperatures. One of the major problems with these materials is the lack of adequate room-temperature ductility and fracture toughness. The overall approach to these investigations was to gain an understanding of the mechanisms for the brittle/ductile (B/D) transition and toughening and to explore the possibility that by process control and/or alloying, either the B/D transition temperature could be lowered or the toughness increased. GRA

N83-14526# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
NUMERICAL METHODS OF PARAMETER IDENTIFICATION FOR PROBLEMS ARISING IN ELASTICITY Ph.D. Thesis - Brown Univ.
James Michael Crowley Jun. 1982 136 p refs
(AD-A119050; AFIT/CI/NR/82-33D) Avail: NTIS HC A07/MF A01 CSCL 12/1

Numerical methods for approximate identification or estimation of constant parameters in certain fourth-order partial differential equations (distributed parameter systems) from data are proposed based upon a reformulation of the problem as an abstract equation

in a Hilbert space. Projections onto suitable subspaces of splines are used to obtain a semi-discrete approximation which is used to estimate the unknown parameters. Covergence of the approximations is proved using linear semigroup theory and the Trotter-Kato theorem. The proposed methods are applied to estimation of parameters in both the Euler-Bernoulli equation with structural and viscous damping and the Timoshenko equation for transverse vibration of a beam. Numerical results are presented. GRA

N83-14527# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
ORDINARY AND STRONG ELLIPTICITY IN THE EQUILIBRIUM THEORY OF INCOMPRESSIBLE HYPERELASTIC SOLIDS
Layne Zee and Eli Sternberg Jul. 1982 72 p refs
(Contract N00014-75-C-0196)
(AD-A119047; TR-51) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this paper explicit necessary and sufficient conditions are established for the ordinary and strong ellipticity of the three dimensional field equations in the nonlinear equilibrium theory of incompressible, homogeneous and isotropic, hyperelastic solids. The resulting system of inequalities involves the local principal stretches directly and in addition restricts the first and second partial derivatives of the strain-energy density with respect to the deformation invariants or the principal stretches. The conditions of ordinary and strong ellipticity are found to coalesce for materials that obey the Baker-Ericksen inequalities and possess a positive shear modulus at infinitesimal deformations. Various implications of these ellipticity conditions for special classes of materials and deformations are explored. Author (GRA)

N83-14528# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
FINITE PLANE DEFORMATION OF AN ELASTIC HALF-SPACE DUE TO A CONCENTRATED SURFACE LOAD
Jeremiah F. Connolly Jul. 1982 39 p refs
(Contract N00014-75-C-0196)
(AD-A119046; TR-50) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper the fully nonlinear equilibrium theory of homogeneous and isotropic, incompressible elastic solids is used to study the elastostatic field in plane strain on a half-plane deformed by a concentrated surface load. Under suitable restrictions on the form of the elastic potential at severe deformations, it is shown that, for materials which ultimately 'harden' in simple shear, the displacement is bounded near the point of application of the load. This is not the case for materials which ultimately soften in shear. Estimates of the true stress tensor near the singular point are given. Author (GRA)

N83-14529# Rockwell International Corp., El Segundo, Calif. Aircraft Div.
THE USERS MANUAL OF AN INTERACTIVE GRAPHICS CRACK GROWTH ANALYSIS PROGRAM. VOLUME 2: INTERACTIVE CRKGRO Final Report, 16 Jan. 1979 - 30 Nov. 1981
James B. Chang and Ko-Wei Liu Wright-Patterson AFB, Ohio AFWAL Nov. 1981 69 p refs 2 Vol.
(Contract F33615-77-C-3121; AF Proj. 2401)
(AD-A118969; NA-81-263; AFWAL-TR-81-3093-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report presents a description of a computer program to be operated interactively in the INTERCOM environment on CDC CYBER computer system. This program is the interactive graphics version of a detailed-level crack-growth analysis program CRKGRO, with an additional capability of inputting the user-coded stress intensity factor solution used for the fatigue crack-growth analysis. GRA

N83-14530# Rockwell International Corp., El Segundo, Calif. Aircraft Div.
A USERS MANUAL FOR A DETAILED LEVEL FATIGUE CRACK GROWTH ANALYSIS COMPUTER CODE. VOLUME 1: THE CRKGRO PROGRAM Final Report, 16 Jan. 1979 - 30 Nov. 1981
James B. Chang, M. Szamossi, and Ko-Wei Liu Wright-Patterson AFB, Ohio AFWAL Nov. 1981 149 p refs 2 Vol.
(Contract F33615-77-C-3121; AF Proj. 2401)
(AD-A118968; NA-81-148; AFWAL-TR-81-3093-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report presents the description of a computer program which was developed to perform detailed fatigue crack-growth analysis on a cycle-by-cycle basis. This program is a two-dimensional crack-growth computer routine. An improved load interaction model which accounts for both the retardation and acceleration effects of the spectrum loading was implemented in the program. This program contains a crack library which consists of 10 subroutines, each containing a specific stress intensity factor solution for a specific crack geometry. The program provides the option for counting the cycles for spectrum loadings through the range-pair counting routine built into the program. It also provides the option to perform parametric studies. Author (GRA)

N83-14531# Rockwell International Corp., El Segundo, Calif. Aircraft Div.
A USER'S MANUAL FOR A COMPUTER PROGRAM TO PREDICT FATIGUE CRACK GROWTH ON FLIGHT-BY-FLIGHT BASIS (FLTGRO) Final Report, Jan. 1979 - Nov. 1981
James B. Chang, M. Szamossi, and Ko-Wei Liu Wright-Patterson AFB, Ohio AFWAL Nov. 1981 104 p refs
(Contract F33615-77-C-3121; AF Proj. 2401)
(AD-A118965; Rept-NA-81-258; AFWAL-TR-81-3094) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report presents the description of a computer code which uses the spectrum characterization method to first convert the random flight spectrum into the equivalent constant-amplitude loading, either one-cycle-per-flight or multisegment-per-flight, and then perform damage accumulation using the linear approximation method. A large saving on computer cost can be achieved by using this program. GRA

N83-14532# Rockwell International Corp., El Segundo, Calif. Aircraft Div.
REVISED STRUCTURAL TECHNOLOGY EVALUATION PROGRAM (STEP) USER'S MANUAL FOR STRUCTURAL SYNTHESIS Final Report, Jan. 1979 - Nov. 1981
James B. Chang and R. Hiyama Wright-Patterson AFB, Ohio AFWAL Nov. 1981 171 p refs
(Contract F33615-77-C-3121; AF Proj. 2401)
(AD-A118964; AFWAL-TR-81-3095) Avail: NTIS HC A08/MF A01 CSCL 01/3

This report presents the description of a structural synthesis program used within the Structural Technology Evaluation Program (STEP). This program is the revised version of APAS III (Automated Pre-Design of Aircraft Structure). The reversion includes implementation of a fatigue crack-growth analysis methodology which realistically accounts for the spectrum load interaction effects to crack growth. Additional work was to add to the program the capability of producing fighter aircraft load spectra. Author (GRA)

N83-14533# Coast Guard Research and Development Center, Groton, Conn. Research and Development Center.
ROTATIONAL LOADING OF DOUBLE-BRAID LINE EYE SPLICES Final Report
Kenneth R. Bitting Jun. 1982 25 p refs Sponsored in part by DOT and Dept. of Navy
(AD-A118911; CGR/DC-12/82; USCG-D-27-82) Avail: NTIS HC A02/MF A01 CSCL 13/10

Two different splicing methods for double-braid line were tested to simulate a loading condition in which the eye of a line under tension is rotated around a bollard as might occur during a docking operation. The blue book splice method, used on double-braid line before 1976, has one leg of the eye that is significantly weaker than the other. The Red Book splice method, a revision of the Blue Book, eliminates the weakness of the blue book splice. It is shown that the strength of a line with the red book eye splice is not reduced when loaded in rotational loading;

both legs of the splice are equal in strength. The weakness is one leg of the blue book splice is confirmed; it fails in rotational loading when the load in the standing part of the line reaches 62% of rated break strength (RBS). The red book splice is approximately 9.8% stronger than the blue book splice in straight-pull conditions. Nylon 3-strand twisted line is included for comparison with double-braid line. It is indicated that one leg of the eye fails in rotational loading when the load in the line reaches 81% RBS because the tucks in the splice fail and the splice pulls apart freeing the end of the leg. Author (GRA)

N83-14534# Southwest Research Inst., San Antonio, Tex.
STUDY OF FATIGUE MECHANISMS IN AEROSPACE STRUCTURAL MATERIALS Annual Scientific Report, 1 Jan. - 31 Dec. 1981
James Lankford, David L. Davidson, Gerald R. Leverant, John E. Hack, and Roy M. Arrowood Feb. 1982 64 p refs
(Contract F49620-78-C-0022; AF Proj. 2306)
(AD-A119199; AFOSR-82-0699TR) Avail: NTIS HC A04/MF A01 CSCL 20/11

The results are summarized of a three phase study of: (1) fatigue crack growth and load interaction modeling in aluminum alloys; (2) the effect of microstructure on susceptibility to hydrogen embrittlement in titanium alloys; and (3) micromechanisms of fatigue crack growth in titanium matrix composites. In the aluminum alloy phase of the work, crack tip strains and micromechanics were determined by a high resolution technique. These strains are used to evaluate which of several possible failure criteria should be incorporated into a crack growth model. It is found that only the critical strain to fracture model was compatible with all of the observed crack tip parameters. In the titanium alloy phase, it is shown that the dwell debit associated with beta heat treated IMI-685 tested at room temperature is due to a hydrogen embrittlement phenomenon rather than a creep fatigue interaction. The effect of heating the as received B4C coated boron fiber, Ti-6Al-4V matrix composite weakens the interface between matrix and fiber.
Author (GRA)

N83-14535# SRI International Corp., Menlo Park, Calif.
DYNAMIC FRACTURE BEHAVIOR OF STRUCTURAL MATERIALS Annual Report, Feb. 1981 - Feb. 1982
D. A. Shockey and J H. Giovanola Mar. 1982 16 p ref
(Contract F49620-81-K-0007; AF Proj. 2306; SRI Proj. PYU-2777)
(AD-A119182; AFOSR-82-0697TR; AR-1) Avail: NTIS HC A02/MF A01 CSCL 11/6

The goals of this research program are first to develop and apply procedures for obtaining more accurate measures of dynamic fracture initiation and propagation toughness, and then to establish the relationship between them. The dynamic initiation toughness K sub Id will be obtained by applying short pulse loads to SEN specimens and using minimum-time crack instability criteria. The dynamic propagation toughness K sub Id will be obtained by measuring the temperature histories in material near the tip of a fast running crack. During the first research year, a Charpy impact machine was modified to produce a well-defined tensile pulse in a SEN specimen. Flat-topped pulses of a shape suitable for K sub Id determinations were obtained that had rise times of about 18 microseconds and durations of 50 microseconds and 100 microseconds. A high-spatial-resolution temperature measuring instrument, based on laser thermoprobe concepts, was constructed and evaluated for use in K sub ID determinations for fast running cracks. By monitoring the change in intensity of a monochromatic light beam passing through a thin CdS film, we could measure the temperature of the film substrate to 0.25 cover a range of 150 C. Thus the technique appears suitable for dynamic fracture investigations. GRA

N83-14536# Brown Univ., Providence, R. I. Center for Dynamical Systems.
PARAMETER ESTIMATION IN TIMOSHENKO BEAM MODELS
H. T. Banks and J. M. Crowley Jun. 1982 36 p refs
(Contract DAAG29-79-C-0161; Grant AF-AFOSR-0198-81; AF Proj. 2304)
(AD-A119234; LCDS-82-14; AFOSR-82-0721TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors present cubic and linear spline-based approximation schemes for models of beams based on the Timoshenko theory. The schemes are used in parameter estimation algorithms; convergence results and numerical findings are reported.
Author (GRA)

N83-14537# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).
RELIABILITY ANALYSIS OF STRUCTURES WITH WEIBULL DISTRIBUTIONS OF LOAD AND STRENGTH TO A GIVEN CONFIDENCE LEVEL
J. Margetson and J. F. Laurillard Jul. 1982 28 p refs
(AD-A119490; PERME-TR-182; DRIC-BR-83968) Avail: NTIS HC A03/MF A01 CSCL 20/11

The statistical variation of load and strength is described by a three parameter Weibull distribution. The Weibull parameters are evaluated by a least square analysis and a method is presented which allows confidence bounds to be assigned to these quantities. A Monte Carlo analysis is used to calculate the reliability of the structure from the load and strength distributions. Author (GRA)

N83-14538# Naval Postgraduate School, Monterey, Calif.
ASYMMETRIC REINFORCEMENTS OF A QUASI-ISOTROPIC GRAPHITE EPOXY PLATE CONTAINING A CIRCULAR HOLE M.S. Thesis
Gary Sean ONeill Jun. 1982 207 p refs
(AD-A119625) Avail: NTIS HC A10/MF A01 CSCL 12/1

The response to uniaxial loading of a graphite epoxy panel containing a one-inch diameter hole was analyzed by finite element analysis and tested experimentally. The analysis modeled the basic unreinforced panel and six different asymmetric reinforcements consisting of additional layers of the same material of circular shape on one side of the panel laminate. The reinforcement configurations varied the volume of the reinforcement from 94% to 162% of the volume of the material removed by the hole, the number of reinforcing layers (1 to 4) and the outer radius of the reinforcement layers from 0.75 inches to 1.5 inches. The orientation of the reinforcing layers was either 45 deg or 0 deg to the load direction. Results of the computational analysis indicated that the reduction of maximum strain (in the direction of the load at a point at the edge of the hole 90 deg from the load direction) by the reinforcements was at most 12%, with apparent dependence on the number of layers used and the volume of the reinforcement. GRA

N83-14539# Virginia Univ. Hospital, Charlottesville. Dept. of Mechanical and Aerospace Engineering.
ON THE OPTIMAL LOCATION OF VIBRATION SUPPORTS
Bo Ping Wang and W. D. Pilkey 1982 8 p refs
(Contract N00014-75-C-0374)
(AD-A119626; A-82-3) Avail: NTIS HC A02/MF A01 CSCL 13/13

The problem of optimal positioning of vibration supports to raise the fundamental natural frequency of a system is studied. It is established that for the optimal locations criterion the corresponding lowest antiresonant frequency is a maximum. A numerical example illustrates this criterion. Author (GRA)

N83-14540# Naval Research Lab., Washington, D. C.
A METHOD TO COMPUTE THE FORCE SIGNATURE OF A BODY IMPACTING ON A LINEAR ELASTIC STRUCTURE USING FOURIER ANALYSIS Interim Report, 1981 - 1982
G. J. O'Hara and R. S. Schechter 17 Sep. 1982 19 p ref
(AD-A119747; NRL-MR-4875) Avail: NTIS HC A02/MF A01 CSCL 20/11

A method is derived to compute the force signature of a body impacting on a linear elastic structure. The time history of the impacting force is reconstructed from the response to impulse and response to the force at various points on the structure. The method is quite general and is applicable to any linear structure. The method is tested on a two degree of freedom system with

various applied forces and reconstructs the forces very accurately. Author (GRA)

N83-14541# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospce Engineering.
OPTIMAL VIBRATION REDUCTION OVER A FREQUENCY RANGE
W. D. Pilkey, L. Kitis, and Bo Ping Wang 1982 35 p refs
(Contract N00014-75-C-0374)
(AD-A119605; A-82-1) Avail: NTIS HC A03/MF A01 CSCL 20/11

This is a review of optimal vibration reduction techniques for systems subject to harmonic excitation over a frequency range. Only passive means of control are considered. The objective functions used for optimization are restricted to those which relate directly to some measure of frequency response. Other common optimization goals such as weight minimization with response constraints are not included. Author (GRA)

N83-14542# George Washington Univ., Washington, D.C.
STATISTICS OF CRACK GROWTH IN ENGINE MATERIALS. VOLUME 1: CONSTANT AMPLITUDE FATIGUE CRACK GROWTH AT ELEVATED TEMPERATURES Interim Report, 15 Jan. 1981 - 15 Jan. 1982
J. N. Yang, G. C. Salivar (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.), and C. G. Annis, Jr. Wright-Patterson AFB, Ohio AFWAL Jul. 1982 93 p refs
(Contract F33615-80-C-5189; AF Proj. 2420)
(AD-A119607; PWAGPD-FR-16444; AFWAL-TR-82-4040-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 12/11

Classically crack propagation analyses for engine components employed in residual life predictions are deterministically based. They typically account for materials scatter by the incorporation of a safety factor. A statistical treatment of materials scatter is necessary to permit a maximum utilization of component life. Two fracture mechanics-based statistical models for the fatigue crack growth damage accumulation in engine materials are proposed and investigated. These statistical models are based on the synergistic fracture mechanics models, i.e., hyperbolic sine crack growth rate function, developed by Pratt and Whitney. Test results of IN-100, a superalloy used in the F-100 engine, at various elevated temperatures, loading frequencies, stress ratios, etc., have been compiled and analyzed statistically. The statistical distributions of (1) the crack growth rate; (2) the propagation life to reach any given crack size; and (3) the crack size at any service life, have been derived. It is demonstrated that the correlation between the test results and two statistical models is very good. Author (GRA)

N83-14543# Dayton Univ., Ohio.
A MODEL FOR PREDICTION BIRD AND ICE IMPACT LOADS ON STRUCTURES Interim Report, 1 Oct. 1977 - 31 Nov. 1979
Louis I. Boehman and Antonios Challita Wright-Patterson AFB, Ohio AFWAL May 1982 96 p refs
(Contract F33615-77-C-5221; AF Proj. 3066)
(AD-A119408; UDR-TR-79-54; AFWAL-TR-82-2046) Avail: NTIS HC A05/MF A01 CSCL 20/4

This report describes a loading model for computation of the pressure distribution exerted on surfaces during bird and ice impacts. Bird and ice impacts are considered as fluid dynamic in nature and are modeled as fluid jets impinging on arbitrarily shaped three dimensional deformable surfaces. A quasi-steady, potential flow analysis is applied to the jet impact problem thereby reducing the impact problem to the problem of solving Laplace's equation. The surface singularity technique is used to solve Laplace's equation. A computer program for computing pressure distributions on both rotating and non-rotating turbine engine components is described. A model for treating slicing of birds and ice by rotating blades is incorporated into this computer program. The loading model computer program is specifically developed to be interfaced with finite-element structural analysis computer programs. Given the instantaneous impacted surface shape and displacement velocity the loading model computer program computes the pressure distribution existing on the impacted surface. The shape of the impact surface is fed to the loading model in the form of finite element surface nodal point coordinates. From this information, the loading model computer program constructs a system of quadrilateral elements covering the impacted surface. GRA

N83-14544# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
FRACTURE MECHANICS ANALYSIS OF THE EFFECTS OF RESIDUAL STRESS ON FRACTURE LIFE Final Report
Joseph F. Throop Jul. 1982 16 p refs
(DA Proj. 1L1-61102-AH-60)
(AD-A119400; AD-E440161; ARLCB-TR-82020) Avail: NTIS HC A02/MF A01 CSCL 20/11

It is re-emphasized here that the effect of residual stress in fatigue is analogous to but not the same as the mean stress effect from applied loads. The inclusion of a residual stress term in the stress intensity factor range of the fatigue crack propagation rate equation permits one to use the residual stress in calculations of fatigue life estimates. Using crack shape factors calculated for given aspect ratios of surface flaws and integrating da/dN, one obtains an equation for the S-N curve which includes the residual stress effect on fatigue performance. This process of calculation reveals that compressive residual stress has a much stronger influence on fatigue life than tensile residual stress does, mainly because the former decreases the stress intensity factor range and increases the critical crack size while the latter only decreases the critical crack size. Numerical solution of an example illustrates an application of these concepts. GRA

N83-14545# Sandia Labs., Albuquerque, N. Mex.
STRUCTURAL-DYNAMIC-RESPONSE CHARACTERISTICS OF DARRIEUS VERTICAL AXIS WIND TURBINES
W. N. Sullivan 1981 26 p refs Presented at the 5th Biennial Wind Energy Conf. And Workshop, Washington, D.C., 5 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003583; SAND-81-1760C; CONF-811043-10) Avail: NTIS HC A03/MF A01

Operational experience with Darrieus type vertical axis wind turbines (VAWTs) indicated that a variety of dynamic issues can affect structural performance of the system. The observation and analysis of structural dynamic responses in the VAWT were divided among three major aspects of the system: rotor vibrations, torsional response of the drive train, and transverse vibrations of the cables. This division is not arbitrary, but can be accurately decoupled from each other in most circumstances. The status of the analytical tools, the quanity and quality of existing experimental confirmation data, and the implications structural dynamic issues have on rotor design are discussed. DOE

N83-14546# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
FATIGUE EVALUATION OF WIND TURBINES. PART 1: THEORETICAL BACKGROUND
Andre Raab (Sikob AB), Bengt Winzell (Linkoeping Univ., Sweden), and Urban Hjorth (Linkoeping Univ., Sweden) Jun. 1982 110 p refs
(Contracts NE-5061-721; NE-5061-015)
(FFA-TN-1982-09) Avail: NTIS HC A06/MF A01

The theoretical background for the computation of fatigue damage in horizontal axis wind turbines is described. Input data are meteorological statistics of mean wind velocities, autospectra, two point coherence and phase spectra of turbulence, together with geometric, mechanical and aerodynamic design specifications. Using probability theory the expected number of stress level exceedences is computed. The interaction of the rotation of the blade with turbulence and the interaction of simultaneously occurring loads is treated. Fatigue is evaluated using the linear cumulative damage theory. Author (ESA)

N83-14547# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
AN ENGINEERING APPROACH TO MIXED MODE THRESHOLDS

A. F. Blom, J. Baecklund, and L. Jilken Aug. 1982 19 p refs Presented at 1st Intern. Conf. on Fatigue Thresholds, Stockholm, 1-3 Jun. 1981
(Contract STU-80-5049)
(FFA-TN-1982-27) Avail: NTIS HC A02/MF A01

Fatigue thresholds were produced in mixed mode conditions ranging from pure mode 1 to pure 2 loading. An experimental procedure where firstly a mode 1 threshold was produced under decreasing stress intensity factor then the load conditions were changed into mixed mode, and secondly a mixed mode threshold was produced under increasing load, was used. Modified compact tension specimens of mild steel were used. For pure mode 2 thresholds compact shear specimens were used. All experiments were restricted to in-plane loading, i.e., no mode 3 displacements were present. The results show unexpectedly low values of the mixed mode thresholds. It is proposed that this may partly be due to a slip mechanism acting through microcracks in front of the arrested monocrack. Author (ESA)

N83-14548# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
SPECIMENS AND TEST EQUIPMENT FOR ECONOMICAL FATIGUE THRESHOLD TESTING
A. F. Blom, J. Baecklund, and L. Jilken Aug. 1982 23 p refs Presented at 1st Intern. Conf. on Fatigue Thresholds, Stockholm, 1-3 Jun. 1981
(Contract STU-80-5049)
(FFA-TN-1982-28) Avail: NTIS HC A02/MF A01

Experimental procedures for the determination of the fatigue threshold stress intensity factor are discussed. An automatic method which is very time and cost effective is presented. The method is of a stress intensity factor decreasing type and uses a mixed load/deformation control procedure which allows the load ratio to be kept constant throughout the test without the aid of a computer. A saving in testing time from 60% to 75% compared with conventional load shedding techniques is achieved. Various test specimens may be used for threshold testing and it is shown that the standard compact tension specimen is not necessarily the best for this purpose. A modified wider specimen is more suitable with respect to test economy. Author (ESA)

N83-14549# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
FATIGUE TESTING OF BOLTED JOINTS IN HUMID AIR AND ALTERNATING IMMERSION
Lars Jarfall (Saab-Scania, Goteberg, Sweden) and Ake Magnusson 16 Sep. 1982 22 p refs
(Contract FMK-F-K-82223-80-183-21-001)
(FFA-TN-1982-34) Avail: NTIS HC A02/MF A01

Bolted joint specimens were fatigue tested in humid air environment with condensation and in an environment involving alternating immersion in distilled water. Comparisons were done with results in other laboratories obtained with laboratory air environment and with salt spray environment. The humid air environment is as severe as the salt spray environment, and the alternate immersion is even worse. Most failures initiate in the fastener holes close to the faying surface, in a region where no corrosion attacks were observed. Faying surface fretting does not initiate fatigue cracking. Author (ESA)

N83-14550# Centre Technique des Industries Mecaniques, Senlis (France).
EXPERIMENTAL VERIFICATION OF A VESSEL DYNAMIC DESIGN COMPUTATION Final Report [VALIDATION EXPERIMENTALE D'UN CALCUL DYNAMIQUE DE RESERVOIR]
M. Bonnefroy 15 May 1982 108 p In FRENCH
(CETIM-11-E-322) Avail: NTIS HC A06/MF A01

An experimental study to verify the dynamic and seismic load finite element method computation carried out in designing an oil containing vessel for a nuclear plant is presented. The location of the accelerometers and the experimental procedure is described. The frequencies of the two vessel modes susceptible to seismic excitation are correctly obtained either by the theoretical computation or by experimental means. However, the influence of the fluid behavior cannot be correctly verified. Author (ESA)

N83-14551# Centre Technique des Industries Mecaniques, Senlis (France).
CALCULATION OF MOTOR-COMPRESSED FOUNDATIONS WHICH ARE IN DIRECT CONTACT WITH THE SOIL Final Report [CALCUL DES FONDATIONS DE MOTEURS-COMPRESSEURS EN CONTACT DIRECT AVEC LE SOL]
Daniel Lefebvre Dec. 1981 97 p refs In FRENCH
(CETIM-15-E-182) Avail: NTIS HC A05/MF A01

The computation of soil and machine foundations responses to a vibration load is studied starting from the experimental determination of the soil properties in the proximity of the foundation. Models giving the differential equations for the system under excitation, horizontal excitation and for the more general case of six degrees of freedom are discussed. The amplitude and phase of vibration at any point of the foundation are obtained by programming a TI-59 pocket computer. The resulting response curves are compared with curves giving the admissable values of the vibration amplitude, particulary when approaching resonant frequencies. Author (ESA)

N83-14552# Cambridge Univ. (England). Dept. of Engineering.
DEFORMATION-MECHANISM MAPS: FURTHER DEVELOPMENT AND CASE STUDIES
M. F. Ashby and H. J. Frost (Dartmouth College) Dec. 1981 140 p refs
(PB82-226879; CUED/C/MATS/TR.90-1981; ISSN-0309-6505) Avail: NTIS HC A07/MF A01 CSCL 20K

A compilation of deformation maps for polycrystalline solids is given. Ways in which the standard maps for metals and alloys and for ceramics can be modified to include work-hardening and transient creep, and the effects of pressure are given. A discussion of scaing laws for mechanical behavior, and behavior at very low and very high strain-rates is given. A set of simple case studies illustrating the uses of deformation maps in materials science, engineering and geophysics is given. GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

N83-14553 Royal Aircraft Establishment, Farnborough (England).
THE ACCURACY OF SEASAT-1 ALTIMETER ALTITUDE MEASURMENTS UNDER VARIOUS SEA STATE CONDITIONS
G. C. White May 1982 56 p refs
(RAE-TR-82059; RAE-Space-616; BR82059) Copyright. Avail: Issuing Activity

The accuracy with which the SEASAT 1 altimeter height measurement can be used to derive the spacecraft CG to mean sea level distance is derived. The shape of a reflected pulse which incorporates a realistic description of a wavefield's wave height probability distribution in its derivation is used to calculate this accuracy. A quantitative description of such a reflected pulse is developed. This description is then used in a simulation procedure to calculate values of the rms errors in the tracking and wave bias, hence the rms height error. This figure of accuracy,

i.e., rms height error is derived for various sea state conditions. S.L.

N83-14554*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MONITORING GLOBAL VEGETATION
R. B. MacDonald, A. G. Houston, R. P. Heydorn, D. B. Botkin, J. E. Estes, and A. H. Strahlr Jun. 1981 22 p refs Presented at the 7th Intern. Symp. on Machine Process. of Remotely Sensed Data, West Lafayette, Ind., 23-26 Jun. 1981 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with California Univ., Santa Barbara Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Proj. AgRISTARS)
(E83-10044; NASA-TM-85166; SR-J2-04300; JSC-18242; NAS 1.15:85166) Avail: NTIS HC A02/MF A01 CSCL 02C

An attempt is made to identify the need for, and the current capability of, a technology which could aid in monitoring the Earth's vegetation resource on a global scale. Vegetation is one of our most critical natural resources, and accurate timely information on its current status and temporal dynamics is essential to understand many basic and applied environmental interrelationships which exist on the small but complex planet Earth. Author

N83-14555*# Research Triangle Inst., Research Triangle Park, N.C.
A COMPARISON OF SURFACES TEMPERATURES FROM HCMM INFRARED DATA WITH FIELD MEASUREMENTS Final Report
Fred M. Vukovich, Principal Investigator Oct. 1982 58 p refs HCMM
(Contract NAS 5-26442)
(E83-10046; NASA-CR-169530; NAS 1.26:169530) Avail: NTIS HC A04/MF A01 CSCL 08C

Heat Capacity Mapping Mission surface temperatures were compared to field data obtained in the Mississippi River, in the Atlantic Ocean in the vicinity of the Nantucket Shoals, and in the eastern Gulf of Mexico. The absolute and relative accuracies of the infrared data were determined. M.G.

N83-14556*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
AN INVESTIGATION INTO THE UTILIZATION OF HCMM THERMAL DATA FOR THE DESCRIMINATION OF VOLCANIC AND EOLIAN GEOLOGICAL UNITS Quarterly Progress Report, 28 Feb. 1981 - 30 Aug. 1982
James W. Head, III, Principal Investigator 30 Aug. 1982 3 p HCMM
(Contract NAS5-26728)
(E83-10047; NASA-CR-169563; NAS 1.26:169563) Avail: NTIS HC A02/MF A01 CSCL 08G

Analysis of HCMM data shows that the resolution provided by the thermal data is inadequate to permit the identification of individual lava flows within the volcanic test sites. Thermal data of southern California reveals that dune complexes at Kelso and Algodomes are found to be too small to permit adequate investigation of their structure. As part of the study of the San Francisco volcanic field, marked variations in the thermal properties of the region between Flagstaff and the Utah State border were observed. Several well-defined units within the Grand Canyon and the Colorado Plateau were recognized and appear to be very suitable for analysis with HCMM, SEASAT and LANDSAT images. Although individual volcanic constructs within the Cascade Range are too small to permit detailed characterization with the thermal data, the regional volcano/tectonic setting offers a good opportunity for comparing the possible thermal distinction between this area and sedimentary fold belts such as those found in the eastern United States. Strong intra-regional variations in vegetation cover were also tentatively identified for the Oregon test site. A.R.H.

N83-14557*# Texas A&M Univ., College Station. Remote Sensing Center.
INVESTIGATION OF REMOTE SENSING TECHNIQUES OF MEASURING SOIL MOISTURE Interim Report, 1 Mar. 1980 - 31 Jan. 1981
Richard W. Newton, Principal Investigator, A. J. Blanchard, J. L. Nieber, R. Lascano, L. Tsang, and C. H. M. vanBavel Jan. 1981 51 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Grant NAG5-31; Proj. AgRISTARS)
(E83-10048; NASA-CR-169564; SM-T2-04363; NAS 1.26:169564; RSC-4242-1) Avail: NTIS HC A04/MF A01 CSCL 02C

Major activities described include development and evaluation of theoretical models that describe both active and passive microwave sensing of soil moisture, the evaluation of these models for their applicability, the execution of a controlled field experiment during which passive microwave measurements were acquired to validate these models, and evaluation of previously acquired aircraft microwave measurements. The development of a root zone soil water and soil temperature profile model and the calibration and evaluation of gamma ray attenuation probes for measuring soil moisture profiles are considered. The analysis of spatial variability of soil information as related to remote sensing is discussed as well as the implementation of an instrumented field site for acquisition of soil moisture and meteorologic information for use in validating the soil water profile and soil temperature profile models. A.R.H.

N83-14558*# Agricultural Research Service, Weslaco, Tex. Remote Sensing Research Unit.
USE OF NEAR-INFRARED VIDEO RECORDING SYSTEM FOR THE DETECTION OF FREEZE DAMAGED CITRUS LEAVES
D. E. Escobar, R. L. Bowen, H. W. Gausman, and G. Cooper, Principal Investigators Sep. 1982 12 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Proj. AgRISTARS)
(E83-10049; NASA-CR-169565; EW-U2-04351; JSC-18563; NAS 1.26:169565) Avail: NTIS HC A02/MF A01 CSCL 02C

A video recording system with a visible light blocking filter to give sensitivity in the 0.78 m to 1.1 m waveband detected freeze-damaged citrus leaves rapidly. With this technique, the time to analyze images can be decreased from about one day for conventional photography to less than one hour for video recording. Author

N83-14559*# Department of Agriculture, Phoenix, Ariz. Water Conservation Lab.
DIURNAL PATTERNS OF WHEAT SPECTRAL REFLECTANCES AND THEIR IMPORTANCE IN THE ASSESSMENT OF CANOPY PARAMETERS FROM REMOTELY SENSED OBSERVATIONS
P. J. Pinter, Jr., R. D. Jackson, S. B. Idso, and R. J. Reginato, Principal Investigators Sep. 1982 49 p refs ERTS
(Proj. AgRISTARS)
(E83-10050; NASA-CR-169566; EW-U2-04349; JSC-18561; NAS 1.26:169566) Avail: NTIS HC A03/MF A01 CSCL 02C

Spectral reflectances of Produra wheat were measured at 13 different times of the day at Phoenix, Arizona, during April 1979 using a nadir-oriented hand-held 4-band radiometer which had bandpass characteristics similar to those on LANDSAT satellites. Different Sun altitude and azimuth angles caused significant diurnal changes in radiant return in both visible and near-IR regions of the spectrum and in several vegetation indices derived from them. The magnitude of these changes were related to different canopy architecture, percent cover and green leaf area conditions. Spectral measurements taken at each time period were well correlated with green leaf area index but the nature of the relationship changed significantly with time of day. Thus, a significant bias in the estimation of the green leaf area index from remotely sensed spectral data could occur if sun angles are not properly accounted for. Author

N83-14560*# Agricultural Research Services, Beltsville, Md.
AGRICULTURAL RESEARCH SERVICE RESEARCH HIGHLIGHTS IN REMOTE SENSING FOR CALENDAR YEAR 1981 Annual Report
Jerry C. Ritchie, comp. Jul. 1982 27 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10051; NASA-CR-169567; EW-R2-04345; JSC-18268; NAS 1.26:169567) Avail: NTIS HC A03/MF A01 CSCL 02C

Selected examples of research accomplishments related to remote sensing are compiled. A brief statement is given to highlight the significant results of each research project. A list of 1981 publication and location contacts is given also. The projects cover emission and reflectance analysis, identification of crop and soil parameters, and the utilization of remote sensing data. M.G.

N83-14561*# Department of Agriculture, Washington, D.C. Statistical Reporting Service.
CONSTRUCTION OF A REMOTELY SENSED AREA SAMPLING FRAME FOR SOUTHERN BRAZIL
Ron Fecso, Wayne Gardner, Bob Hale, Van Johnson, and Steve Pavlasek, Principal Investigators Jun. 1982 44 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10052; NASA-CR-169568; IT-U2-04332; NAS 1.26:169568; AGES-820526) Avail: NTIS HC A03/MF A01 CSCL 08B

A remotely sensed area sampling frame was constructed for selected areas in Southern Brazil. The sampling unit information was stored in digital form in a latitudinal/longitudinal characterized population. Computerized sampling procedures were developed which allow for flexibility in sample unit specifications and sampling designs. Author

N83-14562*# Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
ADJUSTING THE TASSELED CAP BRIGHTNESS AND GREENNESS FACTORS FOR ATMOSPHERIC PATH RADIANCE AND ABSORPTION ON A PIXEL BY PIXEL BASIS
R. D. Jackson, P. N. Slater, and P. J. Pinter, Principal Investigators Jul. 1982 24 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract DI-12-14-5001-38; Proj. AgRISTARS)
(E83-10053; NASA-CR-169569; EW-U2-04334; JSC-18260; NAS 1.26:169569) Avail: NTIS HC A02/MF A01 CSCL 20F

A radiative transfer model was used to convert ground measured reflectances into the radiance at the top of the atmosphere, for several levels of atmospheric path radiance. The radiance in MSS7 (0.8 to 1.1 m) was multiplied by the transmission fraction for atmospheres having different levels of precipitable water. The radiance values were converted to simulated LANDSAT digital counts for four path radiance levels and four levels of precipitable water. These values were used to calculate the Kauth-Thomas brightness, greenness, yellowness, and nonsuch factors. Brightness was affected by surface conditions and path radiance. Greenness was affected by surface conditions, path radiance, and precipitable water. Yellowness was affected by path radiance and nonsuch by precipitable water, and both factors changed only slightly with surface conditions. Yellowness and nonsuch were used to adjust brightness and greenness to produce factors that were affected only by surface conditions such as soils and vegetation, and not by path radiance and precipitable water. Author

N83-14563*# National Oceanic and Atmospheric Administration, Columbia, Mo.
CROP WEATHER MODELS OF CORN AND SOYBEANS FOR AGROPHYSICAL UNITS (APU'S) IN IOWA USING MONTHLY METEOROLOGICAL PREDICTORS
Sharon LeDuc, Principal Investigator Sep. 1982 79 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10054; NASA-CR-169612; YM-I2-04348; JSC-18272; NAS 1.26:169612) Avail: NTIS HC A05/MF A01 CSCL 02C

Models based on multiple regression were developed to estimate corn and soybean yield from weather data for agrophysical units (APU) in Iowa. The predictor variables are derived from monthly average temperature and monthly total precipitation data at meteorological stations in the cooperative network. The models are similar in form to the previous models developed for crop reporting districts (CRD). The trends and derived variables were the same and the approach to select the significant predictors was similar to that used in developing the CRD models. The APU's were selected to be more homogeneous with respect crop to production than the CRDs. The APU models are quite similar to the CRD models, similar explained variation and number of predictor variables. The APU models are to be independently evaluated and compared to the previously evaluated CRD models. That comparison should indicate the preferred model area for this application, i.e., APU or CRD. Author

N83-14564*# Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Service.
COMPARISON OF LANDSAT-2 AND FIELD SPECTROMETER REFLECTANCE SIGNATURES OF SOUTH TEXAS RANGELAND PLANT COMMUNITIES
A. J. Richardson, D. E. Escobar, H. W. Gausman, and J. H. Everitt, Principal Investigators Jul. 1982 23 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(NASA Order S-53876-AG; Proj. AgRISTARS)
(E83-10055; NASA-CR-169570; EW-U2-04335; JSC-18261; NAS 1.26:169570) Avail: NTIS HC A02/MF A01 CSCL 02C

The accuracy was assessed for an atmospheric correction method that depends on clear water bodies to infer solar and atmospheric parameters for radiative transfer equations by measuring the reflectance signature of four prominent south Texas rangeland plants with the LANDSAT satellite multispectral scanner (MSS) and a ground based spectroradiometer. The rangeland plant reflectances produced by the two sensors were correlated with no significant deviation of the slope from unity or of the intercept from zero. These results indicated that the atmospheric correction produced LANDSAT MSS estimates of rangeland plant reflectances that are as accurate as the ground based spectroradiometer. A.R.H.

N83-14565*# National Oceanic and Atmospheric Administration, Columbia, Mo. Environmental Data and Information Service.
COMPARISON OF THE CEAS AND WILLIAMS-TYPE BARLEY YIELD MODELS FOR NORTH DAKOTA AND MINNESOTA
Sharon LeDuc, Principal Investigator Mar. 1982 57 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10056; NASA-CR-169571; YM-U2-04290; JSC-18237; NAS 1.26:169571; YMD-1-4-2(82-1.2)) Avail: NTIS HC A04/MF A01 CSCL 02C

The CEAS and Williams type models were compared based on specified selection criteria which includes a ten year bootstrap test (1970-1979). Based on this, the models were quite comparable; however, the CEAS model was slightly better overall. The Williams type model seemed better for the 1974 estimates. Because that year spring wheat yield was particularly low, the Williams type model should not be excluded from further consideration. Author

N83-14566*# Business and Technological Systems, Inc., Seabrook, Md.
MAGSAT ANOMALY FIELD INVERSION AND INTERPRETATION FOR THE US Final Report
M. A. Mayhew, Principal Investigator 1 Dec. 1982 67 p refs Sponsored by NASA ERTS
(E83-10057; NASA-CR-169591; NAS 1.26:169591; BTS33-82-79/rb) Avail: NTIS HC A04/MF A01 CSCL 08N

Long wavelength anomalies in the total magnetic field measured by MAGSAT over the United States and adjacent areas are inverted to an equivalent layer crustal magnetization distribution. The model is based on an equal area dipole grid at the Earth's surface. Model resolution, defined as the closest dipole spacing giving a solution having physical significance, is about 220 km for MAGSAT data in the elevation range 300-500 km. The magnetization contours correlate well with large scale tectonic provinces. A higher resolution (200 km) model based on relatively noise free synthetic 'pseudodata' is also presented. Magnetic anomaly component data measured by MAGSAT is compared with synthetic anomaly component fields arising from an equivalent source dipole array at the Earth's surface generated from total field anomaly data alone. An excellent inverse correlation between apparent magnetization and heat flow in the western U.S. is demonstrated. A regional heat flow map which is presented and compared with published maps, predicts high heat flow in Nebraska and the Dakotas, suggesting the presence of a 'blind' geothermal area of regional extent. A.R.H.

N83-14567*# Agricultural Research Service, Weslaco, Tex.
COMPARISONS AMONG A NEW SOIL INDEX AND OTHER TWO- AND FOUR-DIMENSIONAL VEGETATION INDICES
C. L. Wiegand and A. J. Richardson, Principal Investigators Sep. 1982 22 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(NASA Order S-70251-AG; NASA Order S-53876-AG; Proj. AgRISTARS)
(E83-10058; NASA-CR-169592; EW-U2-04350; JSC-18562; NAS 1.26:169592) Avail: NTIS HC A02/MF A01 CSCL 02C

The 2-D difference vegetation index (DVI) and perpendicular vegetation index (PVI), and the 4-D green vegetation index (GVI) are compared in LANDSAT MSS data from grain sorghum (Sorghum bicolor, L. Moench) fields for the years 1973 to 1977. PVI and DVI were more closely related to LAI than was GVI. A new 2-D soil line index (SLI), the vector distance from the soil line origin to the point of intersection of PVI with the soil line, is defined and compared with the 4-D soil brightness index, SBI. SLI (based on MSS and MSS7) and SL16 (based on MSS 5 and MSS 6) were smaller in magnitude than SBI but contained similar information about the soil background. These findings indicate that vegetation and soil indices calculated from the single visible and reflective infrared band sensor systems, such as the AVHRR of the TIROS-N polar orbiting series of satellites, will be meaningful for synoptic monitoring of renewable vegetation. Author

N83-14568*# National Oceanic and Atmospheric Administration, Columbia, Mo.
CROP WEATHER MODELS OF BARLEY AND SPRING WHEAT YIELD FOR AGROPHYSICAL UNITS IN NORTH DAKOTA
Sharon LeDuc, Principal Investigator Jun. 1982 36 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10059; NASA-CR-169572; YM-12-04321; JSC-18256; NAS 1.26:169572) Avail: NTIS HC A03/MF A01 CSCL 02C

Models based on multiple regression were developed to estimate barley yield and spring wheat yield from weather data for Agrophysical units(APU) in North Dakota. The predictor variables are derived from monthly average temperature and monthly total precipitation data at meteorological stations in the cooperative network. The models are similar in form to the previous models developed for Crop Reporting Districts (CRD). The trends and derived variables were the same and the approach to select the significant predictors was similar to that used in developing the CRD models. The APU models show sight improvements in some of the statistics of the models, e.g., explained variation. These models are to be independently evaluated and compared to the previously evaluated CRD models. The comparison will indicate the preferred model area for this application, i.e., APU or CRD. Author

N83-14569*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EVALUATION OF THE WILLIAMS-TYPE MODEL FOR BARLEY YIELDS IN NORTH DAKOTA AND MINNESOTA
T. L. Barnett, Principal Investigator Dec. 1981 50 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10060; NASA-TM-85169; YM-U2-04287; JSC-18234; NAS 1.15:85169; YMD-1-4-1(81-12.2)) Avail: NTIS HC A03/MF A01 CSCL 02C

The Williams-type yield model is based on multiple regression analysis of historial time series data at CRD level pooled to regional level (groups of similar CRDs). Basic variables considered in the analysis include USDA yield, monthly mean temperature, monthly precipitation, soil texture and topographic information, and variables derived from these. Technologic trend is represented by piecewise linear and/or quadratic functions of year. Indicators of yield reliability obtained from a ten-year bootstrap test (1970-1979) demonstrate that biases are small and performance based on root mean square appears to be acceptable for the intended AgRISTARS large area applications. The model is objective, adequate, timely, simple, and not costly. It consideres scientific knowledge on a broad scale but not in detail, and does not provide a good current measure of modeled yield reliability. Author

N83-14570*# Arkansas Univ., Fayetteville. Remote Sensing Lab.
ANALYSIS OF GEOLOGIC TERRAIN MODELS FOR DETERMINATION OF OPTIMUM SAR SENSOR CONFIGURATION AND OPTIMUM INFORMATION EXTRACTION FOR EXPLORATION OF GLOBAL NON-RENEWABLE RESOURCES. PILOT STUDY: ARKANSAS REMOTE SENSING LABORATORY, PART 1, PART 2, AND PART 3
V. H. Kaupp, H. C. MacDonald, W. P. Waite, J. A. Stiles, F. S. Frost, K. S. Shanmugam, S. A. Smith, V. Narayanan, and J. C. Holtzman, Principal Investigators 1982 133 p refs Prepared in cooperation with Kansas Univ. Center for Research, Inc., Lawrence Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NAG9-3)
(E83-10061; NASA-CR-169573; ARSL-TR-81-2) Avail: NTIS HC A07/MF A01 CSCL 08G

Computer-generated radar simulations and mathematical geologic terrain models were used to establish the optimum radar sensor operating parameters for geologic research. An initial set of mathematical geologic terrain models was created for three basic landforms and families of simulated radar images were prepared from these models for numerous interacting sensor, platform, and terrain variables. The tradeoffs between the various sensor parameters and the quantity and quality of the extractable geologic data were investigated as well as the development of automated techniques of digital SAR image analysis. Initial work on a texture analysis of SEASAT SAR imagery is reported. Computer-generated radar simulations are shown for combinations of two geologic models and three SAR angles of incidence.A.R.H.

N83-14571*# California Inst. of Tech., Pasadena.
DEVELOPMENT OF MATHEMATICAL TECHNIQUES FOR THE ASSIMILATION OF REMOTE SENSING DATA INTO ATMOSPHERIC MODELS Final Technical Report
John H. Seinfeld, Principal Investigator [1982] 106 p refs ERTS
(Grant NAG1-71)
(E83-10062; NASA-CR-169574; NAS 1.26:169574) Avail: NTIS HC A06/MF A01 CSCL 13B

The problem of the assimilation of remote sensing data into mathematical models of atmospheric pollutant species was investigated. The data assimilation problem is posed in terms of the matching of spatially integrated species burden measurements to the predicted three-dimensional concentration fields from atmospheric diffusion models. General conditions were derived for the reconstructability of atmospheric concentration distributions

from data typical of remote sensing applications, and a computational algorithm (filter) for the processing of remote sensing data was developed. M.G.

N83-14572*# Soil Conservation Service, Denver, Colo.
SNOWMELT RUNOFF MODELING IN SIMULATION AND FORECASTING MODES WITH THE MARTINEC-MANGO MODEL Final Report
Bernard Shafer, E. Bruce Jones, and David M. Frick, Principal Investigators May 1982 419 p refs Prepared in cooperation with Resource Consultants, Inc., Fort Collins, Colo. ERTS
(Contract NAS5-26062; NASA Order S-63971-B)
(E83-10063; NASA-CR-170452; NAS 1.26:170452) Avail: NTIS HC A18/MF A01 CSCL 08H

The Martinec-Rango snowmelt runoff model was applied to two watersheds in the Rio Grande basin, Colorado-the South Fork Rio Grande, a drainage encompassing 216 sq mi without reservoirs or diversions and the Rio Grande above Del Norte, a drainage encompassing 1,320 sq mi without major reservoirs. The model was successfully applied to both watersheds when run in a simulation mode for the period 1973-79. This period included both high and low runoff seasons. Central to the adaptation of the model to run in a forecast mode was the need to develop a technique to forecast the shape of the snow cover depletion curves between satellite data points. Four separate approaches were investigated-simple linear estimation, multiple regression, parabolic exponential, and type curve. Only the parabolic exponential and type curve methods were run on the South Fork and Rio Grande watersheds for the 1980 runoff season using satellite snow cover updates when available. Although reasonable forecasts were obtained in certain situations, neither method seemed ready for truly operational forecasts, possibly due to a large amount of estimated clinatic data for one or two primary base stations during the 1980 season. A.R.H.

N83-14573*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CNPQ/INPE-LANDSAT SYSTEM REPORT OF ACTIVITIES Report, 1 May 1981 - 30 Sep. 1982
Nelson de Jesus Parada, Principal Investigator and Marcio Nogueira Barbosa Oct. 1982 41 p Presented at the LANDSAT Tech. Working Group Meeting, LANDSAT Ground Station Operations Working Group Meeting, and Data Distribution Working Group Meeting, Greenbelt, Md., 20-28 Oct. 1982 Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10064; NASA-CR-169575; NAS 1.26:169575;
INPE-2554-PRE-208) Avail: NTIS HC A03/MF A01 CSCL 14B

The status of the Brazilian LANDSAT facilities and the results achieved are presented. In addition, a LANDSAT product sales/distribution analysis is provided. Data recording and processing capabilities and planned products are addressed. M.G.

N83-14574*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN AUTOMATIC AGRICULTURAL ZONE CLASSIFICATION PROCEDURE FOR CROP INVENTORY SATELLITE IMAGES [UM PROCEDIMENTO AUTOMATICO PARA CLASSIFICACAO DE AREAS AGRICOLAS EM IMAGENS DE SATELITE, PARA USO EM PREVISAO DE SAFRAS]
Nelson de Jesus Parada, Principal Investigator, Gilberto Camara Neto, Flavio Roberto Dias Velasco, and Misae Odo Bueno deOliveira Jul. 1982 11 p refs In PORTUGUESE; ENGLISH summary Presented at the 34th Reuniao da SBPC, Campinas, Sao Paulo, Brazil, 6-14 Jul. 1982 Sponsored by NASA ERTS
(E83-10065; NASA-CR-169576; NAS 1.26:169576;
INPE-2482-PRE/166) Avail: NTIS HC A02/MF A01 CSCL 02C

A classification procedure for assessing crop areal proportion in multispectral scanner image is discussed. The procedure is into four parts: labeling; classification; proportion estimation; and evaluation. The procedure also has the following characteristics: multitemporal classification; the need for a minimum field information; and verification capability between automatic classification and analyst labeling. The processing steps and the main algorithms involved are discussed. An outlook on the future of this technology is also presented. M.G.

N83-14575*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AUTOMATIC INTERPRETATION OF MSS-LANDSAT DATA APPLIED TO COAL REFUSE SITE STUDIES IN SOUTHERN SANTA CATARINA STATE, BRAZIL
Nelson de Jesus Parada, Principal Investigator, Hermann J. H. Kux, and Dalton de Morisson Valeriano May 1982 12 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10066; NASA-CR-169577; NAS 1.26:169577;
INPE-2410-PRE/119) Avail: NTIS HC A02/MF A01 CSCL 05B

The coal mining district in southeastern Santa Catarina State is considered one of the most polluted areas of Brazil. The author has identified significant preliminary results on the application of MSS-LANDSAT digital data to monitor the coal refuse areas and its environmental consequences in this region. Author

N83-14576*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN APPLICATION OF CLUSTER ANALYSIS FOR DETERMINING HOMOGENEOUS SUBREGIONS: THE AGROCLIMATOLOGICAL POINT OF VIEW
Nelson de Jesus Parada, Principal Investigator and Carlos Alberto Cappelletti Jul. 1982 11 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982 Sponsored by NASA ERTS
(E83-10067; NASA-CR-169578; NAS 1.26:169578;
INPE-2490-PRE/173) Avail: NTIS HC A02/MF A01 CSCL 02C

A stratification oriented to crop area and yield estimation problems was performed using an algorithm of clustering. The variables used were a set of agroclimatological characteristics measured in each one of the 232 municipalities of the State of Rio Grande do Sul, Brazil. A nonhierarchical cluster analysis was used and the pseudo F-statistics criterion was implemented for determining the 'cut point' in the number of strata. Author

N83-14577*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
VEGETATION SURVEY IN AMAZONIA USING LANDSAT DATA
Nelson de Jesus Parada, Principal Investigator, Yosio Edemir Shimabukuro, Joao Roberto dosSantos, and Luiz Carlos S. deAquino (Comissao Estadual de Planejamento Agricola, Manaus, Brazil) May 1982 8 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10068; NASA-CR-169579; NAS 1.26:169579;
INPE-2409-PRE/118) Avail: NTIS HC A02/MF A01 CSCL 08F

Automatic Image-100 analysis of LANDSAT data was performed using the MAXVER classification algorithm. In the pilot area, four vegetation units were mapped automatically in addition to the areas occupied for agricultural activities. The Image-100 classified results together with a soil map and information from RADAR images, permitted the establishment of the final legend with six classes: semi-deciduous tropical forest; low land evergreen tropical forest; secondary vegetation; tropical forest of humid areas, predominant pastureland and flood plains. Two water types were identified based on their sediments indicating different geological and geomorphological aspects. A.R.H.

N83-14578*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SPECTRAL DISCRIMINATION OF LITHOLOGIC FACIES IN THE GRANITE OF THE PEDRA BRANCA GOIAS USING LANDSAT 1 DIGITAL IMAGERY [DISCRIMINACAO ESPECTRAL DAS

AREAS DE GREISENIZA CAO NO GRANITO DA SERRA DA PEDRA BRANCA - GO, A TRAVES DE IMAGENS DIGITAIS DO SATELITE LANDSAT-1]

Nelson de Jesus Parada and Raimundo Almeido, Jr. May 1982 14 p refs In PORTUGUESE; ENGLISH summary Presented at the 32nd Brazilian Geol. Congr., Salvador, Bahia, Brazil, 12-18 Sep. 1982 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(E83-10069; NASA-CR-169580; NAS 1.26:169580;

INPE-2418-PRE/126) Avail: NTIS HC A02/MF A01 CSCL 08B

The applicability of LANDSAT MSS imagery for discriminating geobotanical associations observed in zones of cassiterite-rich metasomatic alterations in the granitic body of Serra da Pedra Branca was investigated. Computer compatible tapes of dry and rainy season imagery were analyzed. Image enlargement, corrections, linear contrast stretch, and ratioing of noncorrelated spectral bands were performed using the Image 100 with a grey scale of 256 levels between zero and 255. Only bands 5 and 7 were considered. Band ratioing of noncorrelated channels (5 and 7) of rainy season imagery permits distinction of areas with different vegetation coverage percentage, which corresponds to geobotanial associations in the area studied. The linear contrast stretch of channel 5, especially of the dry season image is very unsatisfactory in this area. A.R.H.

N83-14579*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

REMOTE SENSING TECHNIQUES FOR CONSERVATION AND MANAGEMENT OF NATURAL VEGETATION ECOSYSTEMS [SENSORIAMENTO REMOTO NA CONSERVACAO E MANEJO DE ECOSSISTEMAS NATURAIS VEGETAIS]

Nelson de Jesus Parada, Principal Investigator, Juan Jose Verdesio, and Joao Roberto dosSantos Nov. 1981 26 p refs In PORTUGUESE; ENGLISH summary Presented at the 3rd Simposio Nacio nal de Ecologia, Belo Horizonte, Brazil, 27-31 Jul. 1981 Sponsored by NASA ERTS

(E83-10070; NASA-CR-169581; NAS 1.26:169581;

INPE-2264-PRE/045) Avail: NTIS HC A03/MF A01 CSCL 02F

The importance of using remote sensing techniques, in the visible and near-infrared ranges, for mapping, inventory, conservation and management of natural ecosystems is discussed. Some examples realized in Brazil or other countries are given to evaluate the products from orbital platform (MSS and RBV imagery of LANDSAT) and aerial level (photography) for ecosystems study. The maximum quantitative and qualitative information which can be obtained from each sensor, at different level, are discussed. Based on the developed experiments it is concluded that the remote sensing technique is a useful tool in mapping vegetation units, estimating biomass, forecasting and evaluation of fire damage, disease detection, deforestation mapping and change detection in land-use. In addition, remote sensing techniques can be used in controling implantation and planning natural/artificial regeneration. Author

N83-14580*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MULTITEMPORAL AND GEOBOTANICAL APPROACH IN THE REMOTE DETECTION OF GREISENIZATION AREAS IN THE SERRA DA PEDRA BRANCA GRANITE, GOIAS STATE, BRAZIL

Nelson de Jesus Parada, Principal Investigator and Raimundo Almeida Filho Jun. 1982 10 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(E83-10071; NASA-CR-169582; NAS 1.26:169582;

INPE-2446-PRE/145) Avail: NTIS HC A02/MF A01 CSCL 08F

A multiseasonal analysis of LANDSAT multispectral images in CCT format permitted the mapping of lithologic facies in the Pedra Branca Granite, using geobotanical associations, which occur in the form of variations in the density of the cerrado vegetation, as well as the predominance of certain distinct vegetation species. Dry season images did not show very good results in lithological differentiation due to anomalous illumination conditions related to the low solar elevation and the homogeneity in the vegetation cover, specially the grass that becomes dry during this season. Rainy season images, on the other hand, allowed the separation of the lithological types, a fact that can be attributed to a greater differentiation among the geobotanical associations. The muscovite-granite facies with greisenization zones within the Serra da Pedra Branca were mapped. This methodology can be successfully applied to similar known granite bodies elsewhere in the Tin Province of Goias. Author

N83-14581*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

METHOD OF INTERPRETATION OF REMOTELY SENSED DATA AND APPLICATIONS TO LAND USE [METODOGIA DE INTERPRETACAO DE DADOS DE SENSORIAMENTO REMOTO E APLICACOES NO USO DA TERRA]

Nelson de Jesus Parada, Principal Investigator, Armando Pacheco dosSantos, Celina Foresti, Evlyn Marcia Leao deMoraesNovo, Madalena Niero, and Magda Adelaide Lombardo Nov. 1981 65 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E83-10072; NASA-CR-169583; NAS 1.26:169583;

INPE-2261-MD/016) Avail: NTIS HC A04/MF A01 CSCL 08B

Instructional material describing a methodology of remote sensing data interpretation and examples of applicatons to land use survey are presented. The image interpretation elements are discussed for different types of sensor systems: aerial photographs, radar, and MSS/LANDSAT. Visual and automatic LANDSAT image interpretation is emphasized. Author

N83-14582*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

LANDSAT AND RADAR MAPPING OF INTRUSIVE ROCKS IN SE-BRAZIL

Nelson de Jesus Parada, Principal Investigator, A. R. dosSantos, C. E. dosAnjos, J. C. Moreira, M. P. Barbosa, and P. Veneziani May 1982 12 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982 Sponsored by NASA ERTS

(E83-10073; NASA-CR-169584; NAS 1.26:169584;

INPE-2417-PRE/125) Avail: NTIS HC A02/MF A01 CSCL 08B

The feasibility of intrusive rock mapping was investigated and criteria for regional geological mapping established at the scale of 1:500,00 in polycyclic and polymetamorphic areas using the logic method of photointerpretation of LANDSAT imagery and radar from the RADAMBRASIL project. The spectral behavior of intrusive rocks, was evaluated using the interactive multispectral image analysis system (Image-100). The region of Campos (city) in northern Rio de Janeiro State was selected as the study area and digital imagery processing and pattern recognition techniques were applied. Various maps at the 2:250,000 scale were obtained to evaluate the results of automatic data processing. Author

N83-14583*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

INTERPRETATION OF REMOTELY SENSED DATA AND ITS APPLICATIONS IN OCEANOGRAPHY [INTERPRETACAO DE DADOS DE SENSORIAMENTO REMOTO E APLICACOES EM OCEANOGRAFIA]

Nelson de Jesus Parada, Principal Investigator, Keiko Tanaka, Hector Manuel Inostroza, and Juan Jose Verdesio Apr. 1982 65 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS

(E83-10074; NASA-CR-169585; NAS 1.26:169585;

INPE-2368-MD/019) Avail: NTIS HC A04/MF A01 CSCL 08C

The methodology of interpretation of remote sensing data and its oceanographic applications are described. The elements of image interpretation for different types of sensors are discussed. The sensors utilized are the multispectral scanner of LANDSAT, and the thermal infrared of NOAA and geostationary satellites.

Visual and automatic data interpretation in studies of pollution, the Brazil current system, and upwelling along the southeastern Brazilian coast are compared. J.D.

N83-14584*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
INPE LANDSAT-D THEMATIC MAPPER COMPUTER COMPATIBLE TAPE FORMAT SPECIFICATION
Nelson de Jesus Parada, Principal Investigator and Ricardo Cartaxo Modesto deSouza 4 Oct. 1982 68 p Presented at LANDSAT Tech. Working Group Meeting, Greenbelt, Md., 20-22 Oct. 1982 Sponsored by NASA ERTS
(E83-10075; NASA-CR-169586; NAS 1.26:169586;
INPE-2553-PRE/207) Avail: NTIS HC A04/MF A01 CSCL 09B

The format of the computer compatible tapes (CCT) which contain Thematic Mapper (TM) imagery data acquired from the LANDSAT D and D Prime satellites by the INSTITUTO DE PERSQUISAS ESPACIALS (CNPq-INPE/BRAZIL) is defined. Author

N83-14585*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EVALUATION OF REFORESTATION USING REMOTE SENSING TECHNIQUES
Nelson de Jesus Parada, Principal Investigator, Pedro Hernandez Filho, Yosio Edemir Shimabukuro, and Joao Roberto dosSantos May 1982 9 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982 Sponsored by NASA ERTS
(E83-10076; NASA-CR-169587; NAS 1.26:169587;
INPE-2413-PRE/121) Avail: NTIS HC A02/MF A01 CSCL 02F

The utilization of remotely sensed orbital data for forestry inventory. The study area (approximately 491,100 ha) encompasses the municipalities of Ribeirao Preto, Altinopolis, Cravinhos, Serra Azul, Luis Antonio, Sao Simao, Sant Rita do Passa Quatro and Santa Rosa do Viterbo (Sao Paulo State). Materials used were LANDSAT data from channels 5 and 7 (scale 1:250,000) and CCT's. Visual interpretation of the imagery showed that for 1977 a total of 37,766.00 ha and for 1979 38,003.75 ha were reforested with Pinus and Eucalyptus within the area under study. The results obtained show that LANDSAT data can be used efficiently in forestry inventory studies. Author

N83-14586*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ESTIMATION OF THE SUGAR CANE CULTIVATED AREA FROM LANDSAT IMAGES USING THE TWO PHASE SAMPLING METHOD
Nelson de Jesus Parada, Principal Investigator, Carlos Alberto Cappelletti, Francisco Jose Mendonca, David Chung Liang Lee, and Yosio Edemir Shimabukuro Jul. 1982 6 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982 Sponsored by NASA ERTS
(E83-10077; NASA-CR-169588; NAS 1.26:169588;
INPE-2489-PRE/172) Avail: NTIS HC A02/MF A01 CSCL 02C

A two phase sampling method and the optimal sampling segment dimensions for the estimation of sugar cane cultivated area were developed. This technique employs visual interpretations of LANDSAT images and panchromatic aerial photographs considered as the ground truth. The estimates, as a mean value of 100 simulated samples, represent 99.3% of the true value with a CV of approximately 1%; the relative efficiency of the two phase design was 157% when compared with a one phase aerial photographs sample. Author

N83-14587*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE COMPUTER TREATMENT OF REMOTELY SENSED DATA: AN INTRODUCTION TO TECHNIQUES WHICH HAVE GEOLOGIC APPLICATIONS [O TRATAMENTO POR COPUTADOR DE DADOS DE SENSORES REMOTOS: UMA INTRODUCAO DE TECNICAS QUE VISAM APLICACOES GEOLOGICAS]
Nelson de Jesus Parada, Principal Investigator, Waldir Renato Paradella, and Icaro Vitorello May 1982 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 32nd Brazilian Geol. Congr., Salvador, Bahia, 12-18 Sep. 1982 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10078; NASA-CR-169589; NAS 1.26:169589;
INPE-2419-PRE/127) Avail: NTIS HC A02/MF A01 CSCL 08G

Several aspects of computer-assisted analysis techniques for image enhancement and thematic classification by which LANDSAT MSS imagery may be treated quantitatively are explained. On geological applications, computer processing of digital data allows, possibly, the fullest use of LANDSAT data, by displaying enhanced and corrected data for visual analysis and by evaluating and assigning each spectral pixel information to a given class. Author

N83-14588*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON OF DIVERSE METHODS FOR THE CORRECTION OF ATMOSPHERIC EFFECTS ON LANDSAT AND SKYLAB IMAGES [COMPARACAO DE DIVERSOS METODOS PARA A CORRECAO DE EFEITO ATMOSFERICO EM IMAGENS LANDSAT E SKYLAB]
Nelson de Jesus Parada, Principal Investigator, Gilberto Camara, Luiz Alberto Vieira Dias, Nelson Delfino d'Avila Mascarenhas, Ricardo Cartaxo Modesto deSouza, and Antonio Eduardo Costa Pereira Jul. 1982 27 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Reuniao Anual da SBPC, Salvador, Bahia, Jul. 1981 Sponsored by NASA ERTS
(E83-10079; NASA-CR-165122; NAS 1.26:165122;
INPE-2471-PRE/160) Avail: NTIS HC A03/MF A01 CSCL 05B

Earth's atmosphere reduces a sensors ability in currently discriminating targets. Using radiometric correction to reduce the atmospheric effects may improve considerably the performance of an automatic image interpreter. Several methods for radiometric correction from the open literature are compared leading to the development of an atmospheric correction system. A.R.H.

N83-14589*# Tokyo Univ. (Japan). Geophysics Research Lab.
JAPANESE MAGSAT TEAM Progress Report, 1 Apr. - 31 Jul. 1982
Naoshi Fukushima, Principal Investigator 5 Aug. 1982 12 p Sponsored by NASA ERTS
(E83-10080; NASA-CR-169590; NAS 1.26:169590; PR-6) Avail: NTIS HC A02/MF A01 CSCL 08G

CHRONINT and investigator B tapes as well as CHRONFIN data are being analyzed using a graphical display to illustrate X,Y,Z components as well as their residuals from the MGST (4/81) model. In addition to surveys of the vicinity of Japan, an aerial magnetic survey was conducted around Syowa Station in the Antarctic. Relative data collected by polar orbiting satellites are also being studied. Techniques used to separate external and internal fields from the vector data along the orbital paths; analysis of the frequency of the toroidal current in the equatorial ionosphere; investigation of the sudden storm commencement observed by MAGSAT; determination of the structure of field aligned currents associated with substorms; and calculation of the total electric current passing through the plane encircled by the MAGSAT orbit are discussed. A.R.H.

N83-14590*# Iowa Univ., Iowa City. Dept. of Geology.
USE OF MAGSAT ANOMALY DATA FOR CRUSTAL STRUCTURE AND MINERAL RESOURCES IN THE US MIDCONTINENT Quarterly Report, period ending 30 Sep. 1982
Robert S. Carmichael, Principal Investigator 30 Sep. 1982 5 p ERTS
(Contract NAS 5-26425)
(E83-10082; NASA-CR-169594; NAS 1.26:169594; QR-7) Avail: NTIS HC A02/MF A01 CSCL 08G

Progress in the correlation of MAGSAT anomaly maps with geological and geophysical data sets is reported. An excerpt from Bouguer gravity map of the U.S. was filtered to retain wavelengths of 250 km, thus being physically somewhat analogous to MAGSAT

data at 400 km height. Residual anomalies were extracted to compare with the satellite magnetics. M.G.

N83-14591*# Miami Univ., Fla. School of Marine and Atmospheric Science.

INVESTIGATIONS OF MEDIUM WAVELENGTH MAGNETIC ANOMALIES IN THE EASTERN PACIFIC USING MAGSAT DATA Interim Report, 1 Apr. - 30 Jun. 1982

Christopher G. A. Harrison, Principal Investigator Jul. 1982 13 p Sponsored by NASA ERTS

(E83-10083; NASA-CR-169595; NAS 1.26:169595) Avail: NTIS HC A02/MF A01 CSCL 08G

A series of plots illustrating the inversion of MAGSAT scalar anomaly data and the production of scalar anomaly maps at constant altitude are presented and discussed. M.G.

N83-14592*# Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).

GRAVIMETRIC MAPS OF THE CENTRAL AFRICAN REPUBLIC

J. Albouy and R. Godivier, Principal Investigators [1982] 14 p Sponsored by NASA ERTS

(E83-10084; NASA-CR-169596; NAS 1.26:169596) Avail: NTIS HC A02/MF A01 CSCL 08B

Gravimetric maps of the Central African Republic are described including a map of Bouguer anomalies at 1/1,000,000 in two sections (eastern sheet, western sheet) and a map, in color, of Bouguer anomalies at 1/2,000,000. Instrumentation, data acquisition, calibration, and data correction procedures are discussed. M.G.

N83-14593*# Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.

AN INVESTIGATION OF MAGSAT AND COMPLEMENTARY DATA EMPHASIZING PRECAMBRIAN SHIELDS AND ADJACENT AREAS OF WEST AFRICA AND SOUTH AMERICA Quarterly Report, 1 Apr. - 30 Sep. 1982

David A. Hastings, Principal Investigator 30 Sep. 1982 4 p Sponsored by NASA ERTS

(Contract DI-14-08-0001-20129)

(E83-10085; NASA-CR-169607; NAS 1.26:169607) Avail: NTIS HC A02/MF A01 CSCL 08G

A mineral deposits overlay was prepared to the van der Grinten projection geological world map and coloring of the map was initiated. The Mercator projection version was proofread and some preliminary modeling of MAGSAT anomalies for South America were undertaken. A.R.H.

N83-14594*# Wisconsin Univ., Madison.

INVESTIGATION OF ANTARCTIC CRUST AND UPPER MANTLE USING MAGSAT AND OTHER GEOPHYSICAL DATA Quarterly Status and Technical Progress Report

C. R. Bentley, Principal Investigator [1982] 15 p refs ERTS

(Contract NAS5-15977)

(E83-10086; NASA-CR-169597; NAS 1.26:169597; QSTPR-10) Avail: NTIS HC A02/MF A01 CSCL 08G

Antarctica is the perfect proving ground for testing data reduction procedures which are alternatives to the standard procedure employing polynomial fitting. Unreduced data (observed values minus corefield model theo each pass) were averaged in 3 degree bins. The resulting map was then high pass filtered using a finite Fourier transform filter so that spectral peaks between 4200 km and 5280 km were diminished by 1/3, peaks corresponding to wavelengths greater than or equal to 5280 km were diminished by 1/2, and the d.c. component was set equal to zero. The surface subtracted in this way differs from the polynomials used in the standard method in that it is static over the 5 north data window. The map produced is presented and the effects of the static model are compared to those of the dynamic mode. A.R.H.

N83-14595*# Purdue Univ., Lafayette, Ind.

CONTEXTUAL CLASSIFICATION OF MULTISPECTRAL IMAGE DATA: AN UNBIASED ESTIMATOR FOR THE CONTEXT DISTRIBUTION

James C. Tilton, Philip H. Swain, Principal Investigators, and Stephen B. Vardeman (Iowa State Univ. of Science and Technology) 1981 9 p refs Presented at the Machine Process. of Remotely Sensed Data Symp., 1981 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(Contract NAS9-15466; Grant NSF MCS-78-04366)

(E83-10087; NASA-CR-167633; NAS 1.26:167633; LARS-TR-070381) Avail: NTIS HC A02/MF A01 CSCL 09B

A key input to a statistical classification algorithm, which exploits the tendency of certain ground cover classes to occur more frequently in some spatial context than in others, is a statistical characterization of the context: the context distribution. An unbiased estimator of the context distribution is discussed which, besides having the advantage of statistical unbiasedness, has the additional advantage over other estimation techniques of being amenable to an adaptive implementation in which the context distribution estimate varies according to local contextual information. Results from applying the unbiased estimator to the contextual classification of three real LANDSAT data sets are presented and contrasted with results from non-contextual classifications and from contextual classifications utilizing other context distribution estimation techniques. A.R.H.

N83-14596*# Lamont-Doherty Geological Observatory, Palisades, N. Y.

THE INTERMEDIATE WAVELENGTH MAGNETIC ANOMALY FIELD OF THE NORTH PACIFIC AND POSSIBLE SOURCE DISTRIBUTIONS Final Report

J. L. LaBrecque, S. C. Cande, and R. D. Jarrard, Principal Investigators (Arco Oil and Gas Co., Dallas, Tex.) [1983] 78 p refs Original contains color illustrations ERTS

(Contract NAS5-25891)

(E83-10088; NASA-CR-169598; NAS 1.26:169598) Avail: NTIS HC A05/MF A01 CSCL 08N

A technique that eliminates external field sources and the effects of strike aliasing was used to extract from marine survey data the intermediate wavelength magnetic anomaly field for (B) in the North Pacific. A strong correlation exists between this field and the MAGSAT field although a directional sensitivity in the MAGSAT field can be detected. The intermediate wavelength field is correlated to tectonic features. Island arcs appear as positive anomalies of induced origin likely due to variations in crustal thickness. Seamount chains and oceanic plateaus also are manifested by strong anomalies. The primary contribution to many of these anomalies appears to be due to a remanent magnetization. The source parameters for the remainder of these features are presently unidentified ambiguous. Results indicate that the sea surface field is a valuable source of information for secular variation analysis and the resolution of intermediate wavelength source parameters. Author

N83-14597*# MacQuarie Univ., North Ryde (Australia). Centre for Geophysical Exploration Research.

THE MAGSAT PROJECT IN AUSTRALIA Status Report

Sep. 1982 8 p Sponsored by NASA ERTS

(E83-10089; NASA-CR-169599; NAS 1.26:169599) Avail: NTIS HC A02/MF A01 CSCL 05B

The first version of the MAGSAT selection and reduction software was completed as well as a major enhancement to support geomagnetic vector data selection and reduction. All MAGSAT data over an area between 90 E and 180 E and between 0 and 50 S were reduced. This area includes the Australasian region and surrounding oceans. Nearly 200 profiles across Australia satisfied the criteria for data. The reduced geomagnetic field inferred to be caused by sources within the lithosphere was interpreted. During reduction, magnetic effects caused by all other causes were eliminated. Some possible correlation with major tectonic structures and known continental scale heat flow anomalies were noted. A.R.H.

N83-14598*# California Univ., Santa Barbara. Geography Remote Sensing Unit.
NEOTECTONICS OF THE SAN ANDREAS FAULT SYSTEM: BASIN AND RANGE PROVINCE JUNCTURE Semiannual Progress Report, May - Oct. 1981
John E. Estes and John C. Crowell, Principal Investigators Oct. 1981 7 p ERTS
(Grant NAG5-177)
(E83-10090; NASA-CR-169600; NAS 1.26:169600) Avail: NTIS HC A02/MF A01 CSCL 08G

A thorough evaluation of all LANDSAT coverage of the study area (considering atmospheric clarity, seasonal aspects, specific swath location, and digital quality) resulted in the selection of two consequetive (continuously recorded) scenes for detailed analyses. The acquisition of HCMM and SEASAT imagery as well as high altitude U-2 uniform coverage is being considered. A bibliography of previous geological studies and methodological examples is estimated to be 70% complete. A.R.H.

N83-14599*# Energy, Mines and Resources Canada, Ottawa (Ontario). Earth Physics Branch.
THE REDUCTION, VERIFICATION AND INTERPRETATION OF MAGSAT MAGNETIC DATA OVER CANADA Progress Report
R. L. Coles, G. V. Haines, G. Jansen vanBeek, J. K. Walker, and L. R. Newitt, Principal Investigators Jul. 1982 2 p Sponsored by NASA ERTS
(E83-10091; NASA-CR-169601; NAS 1.26:169601; PR-6) Avail: NTIS HC A02/MF A01 CSCL 08N

Research into an approach for altitude adjustments for MAGSAT or similar data acquired over a range of altitudes is progressing. The technique shows promise not only in the production of refined anomaly maps but also in the derivation of regional charts of the magnetic elements from satellite and ground data. Correlations between MAGSAT anomalies and other geophysical and geological data are being explored further and quantitative modelling of some features has begun. The form of some anomalies may change as the maps are refined by the technique being developed. Emphasis is being given to the Canadian regions, although analogous features elsewhere are being considered. Author

N83-14600*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Space Physics and Instrumentation Group.
INVESTIGATION OF MAGSAT AND TRIAD MAGNETOMETER DATA TO PROVIDE CORRECTIVE INFORMATION ON HIGH-LATTITUDE EXTERNAL FIELDS Final Report
T. A. Potemra, Principal Investigator, M. Sugiura, and L. J. Zanettic Jul. 1982 19 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10093; NASA-CR-169603; NAS 1.26:169603) Avail: NTIS HC A02/MF A01 CSCL 08N

Disturbances in the MAGSAT magnetometer data set due to high latitude phenomena were evaluated. Much of the categorization of disturbances due to Birkeland currents, ionospheric Hall currents, fine structure and wave phenomena was done with the MAGSAT data catalog. A color graphics technique was developed for the display of disturbances from multiple orbits, from which one can infer a 'global-image' of the current systems of the auroral zone. The MAGSAT 4/81 magnetic field model appears to represent the Earth's main field at high latitudes very well for the epoch 1980. MAGSAT's low altitude allows analysis of disturbances in the magnetometer data due to ionospheric electrojet currents. These current distributions were modeled properly for single events as a precursor to the inference of the Birkeland current system. MAGSAT's orbit was approximately shared with that of the Navy/APL TRIAD satellite. This allowed space-time studies of the magnetic disturbance signatures to be performed, the result being an approximately 75% agreement in, as well as high frequency of, signatures due to Birkeland currents. Thus the field-aligned currents are a steady-state participant in the Earth's magnetospheric current system. M.G.

N83-14601*# Business and Technological Systems, Inc., Seabrook, Md.
EQUIVALENT SOURCE MODELING OF THE MAIN FIELD USING MAGSAT DATA Final Report
M. A. Mayhew and R. H. Estes, Principal Investigators May 1982 38 p refs ERTS
(Contract NAS5-26047)
(E83-10094; NASA-CR-169604; NAS 1.26:169604; BTS33-82-60/br) Avail: NTIS HC A03/MF A01 CSCL 08N

An iterative least squares estimation algorithm with the capability for including a priori statistical information was implemented to recover multiple magnetic dipole models of the Earth's main magnetic field. The dipoles are fixed to a specified radius at or below the core-mantle boundary and centered on equal area blocks. The algorithm can solve for dipole magnitudes only (fixed orientations), or allow full freedom of orientation and solve for vector components. External field parameters and observatory anomaly biases can also be estimated simultaneously. Time dependence is modeled using first time derivatives for dipole vector components. Single-epoch and time dependent dipole models are derived using MAGSAT and observatory annul means data. Equivalent spherical harmonic representation are computed in closed form from the dipole models and compared with truncated spherical harmonic models estimated in the standard way from the same data sets. In particular, a 21 deg spatial resolution model based on 93 dipoles was computed based on observatory annual means data and a selected MAGSAT data set and was compared with candidate IGRF 1975 models and their 1980 secular variation. M.G.

N83-14602*# Analytic Sciences Corp., Reading, Mass.
INVESTIGATING TECTONIC AND BATHYMETRIC FEATURES OF THE INDIAN OCEAN USING MAGSAT MAGNETIC ANOMALY DATA Quarterly Progress Report, 1 Apr. - 30 Jun. 1982
Richard V. Sailor and Andrew R. Lazarewicz, Principal Investigators 19 Jul. 1982 28 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-26424)
(E83-10095; NASA-CR-169605; NAS 1.26:169605; PR-1325-6) Avail: NTIS HC A03/MF A01 CSCL 08E

An equivalent source anomaly map and a map of the relative magnetization for the investigation region were produced. Gravimetry, bathymetry, and MAGSAT anomaly maps were contoured in pseudocolor displays. Finally, an autoregressive spectrum estimation technique was verified with synthetic data and shown to be capable of resolving exponential power spectra using small samples of data. Interpretations were made regarding the relationship between MAGSAT data spectra and crustal anomaly spectra. M.G.

N83-14603*# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
JOINT AIR SEA INTERACTION (JASIN) EXPERIMENT, NORTHWEST COAST OF SCOTLAND Final Report
Joost A. Businger [1981] 2 p refs
(Contract JPL-955528)
(NASA-CR-169631; NAS 1.26:169631) Avail: NTIS HC A02/MF A01 CSCL 08C

The joint air sea interaction (JASIN) experiment took place off the Northwest coast of Scotland. Sea surface and boundary layer parameters were measured. The JASIN data was used as ground truth for various sensors on the SEASAT satellite. S.L.

N83-14604*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF THE POTENTIAL OF ONE TO THREE SEASAT-SMMR CHANNELS IN RETRIEVING SEA SURFACE TEMPERATURE
Prem Chand Pandey (Space Applications Centre, Ahmedabad, India) and Stacy Kniffen 15 Nov. 1982 36 p refs Sponsored by NASA and NAS-NRC
(NASA-CR-169660; JPL-Pub-82-89; NAS 1.26:169660) Avail: NTIS HC A03/MF A01 CSCL 08C

The scanning multichannel microwave radiometer (SMMR) aboard the SEASAT satellite measured emitted radiation in both horizontal and vertical polarizations at microwave frequencies of 6.6, 10.69, 18.0, 21.0 and 37.0 GHz. Retrieval algorithms, for sea surface temperature (SST) determination, from subsets of one to three SMMR channels are obtained by a two step statistical technique. The technique first selects the best subsets of a given size defined by an R2 criterion (coefficient of determination), of a given size by the application of an efficient 'leaps and bounds' technique on a statistical data base. It then performs a regression analysis on the selected subsets. The statistical data base employed a large (600) set of seasonally and geographically diverse atmospheric and surface parameters for radiative transfer calculations. The results of the study of one to three channel subset retrieval algorithms indicate the possibility of using 6.6V, 6.6H and 18V channels for SST determination from SEASAT-SMMR data. B.W.

N83-14605*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
PRELIMINARY STUDY OF GPS ORBIT DETERMINATION ACCURACY ACHIEVABLE FROM WORLDWIDE TRACKING DATA
D. R. Larden and P. L. Bender (NBS, Boulder, Colo.) [1982] 6 p refs
(NASA-CR-169693; NAS 1.26:169693) Avail: NTIS HC A02/MF A01 CSCL 08B

The improvement in the orbit accuracy if high accuracy tracking data from a substantially larger number of ground stations is available was investigated. Observations from 20 ground stations indicate that 20 cm or better accuracy can be achieved for the horizontal coordinates of the GPS satellites. With this accuracy, the contribution to the error budget for determining 1000 km baselines by GPS geodetic receivers would be only about 1 cm. E.A.K.

N83-14606*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
TOPEX ORBIT DETERMINATION USING GPS SIGNALS PLUS A SIDETONE RANGING SYSTEM
Peter L. Bender and Douglas R. Larden [1982] 6 p refs Sponsored in part by NASA
(NASA-CR-169694; NAS 1.26:169694) Avail: NTIS HC A02/MF A01

The GPS orbit determination was studied to see how well the radial coordinate for altimeter satellites such as TOPEX could be found by on board measurements of GPS signals, including the reconstructed carrier phase. The inclusion on altimeter satellites of an additional high accuracy tracking system is recommended. It is suggested that a sidetone ranging system is used in conjunction with TRANET 2 beacons. E.A.K.

N83-14607*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LONGWALL SHEARER TRACKING SYSTEM Patent Application
Peter D. Poulsen (Adjunct Systems, Inc.), Richard J. Stein, and Robert E. Pease, inventors (to NASA) Filed 15 Nov. 1982 20 p (Contract NAS8-34185)
(NASA-Case-MFS-25717-1; US-Patent-Appl-SN-441897) Avail: NTIS HC A02/MF A01 CSCL 08I

A tracking system for measuring and recording the movements of a longwall shearer vehicle includes an optical tracking assembly carried at one end of a desired vehicle path and a retroreflector assembly carried by the vehicle. Continuous horizontal and vertical light beams are alternately transmitted by means of a rotating Dove prism to the reflector assembly. A vertically reciprocating reflector interrupts the continuous light beams and converts these to discrete horizontal and vertical light beam images transmitted at spaced intervals along the path. A second rotating Dove prism rotates the vertical images to convert them to a second series of horizontal images while the first mentioned horizontal images are left unrotated and horizontal. NASA

N83-14608# European Space Agency, Paris (France).
SATELLITE REMOTE SENSING FOR DEVELOPING COUNTRIES
N. Longdon, ed. and G. Levy, ed. Jun. 1982 245 p refs Proc. of EARSeL-ESA/ASSA Symp., Igls, Austria, 20-21 Apr. 1982
(ESA-SP-175; ISSN-0379-6566) Avail: NTIS HC A11/MF A01; ESA, Paris FF 125 (Member States and CV, AU, NO) + 20% others

Remote sensing technology transfer to developing nations was discussed. Data processing, particularly of LANDSAT data, was considered. Applications of remote sensing, and the role of ESA in meeting the remote sensing requirements of the Third World were examined. For individual titles, see N83-14609 through N83-14637.

N83-14609# Commission of the European Communities, Brussels (Belgium).
THE EUROPEAN COMMUNITY, DEVELOPMENT AND SATELLITE TECHNOLOGY
G. Boggio and C. White *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 11-18 (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

European Community scientific and technical cooperation with developing nations, particularly in remote sensing technology, is discussed. Cooperation programs recognize the importance of improving the capabilities of the developing nations. In agriculture, the Community is studying the benefits of land use mapping for rice production in the Sahel. Mineral exploration and meteorological projects are also underway. Author (ESA)

N83-14610# European Space Agency, Toulouse (France). Earth Observation Programmes Dept.
THE EUROPEAN SPACE AGENCY'S EARTH OBSERVATION SATELLITE PROGRAMS IN THE 1980'S
D. Lennertz *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 21-33 (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The METEOSAT, Sirio-2, Earthnet, Spacelab, and ERS-1 programs are described. METEOSAT will image the surface and cloud system in the visible and IR bands every 30 min. It will also monitor water vapor absorption. Sirio 2 should have disseminated meteorological information to Africa and synchronized atomic clocks. Earthnet will disseminate LANDSAT, heat capacity mapping mission, Nimbus 7 and Seasat data. Spacelab experiments include photographic mapping and microwave remote sensing. The first ERS-1 mission is oriented towards ice and ocean monitoring. Author (ESA)

N83-14611# Centre National de la Recherche Scientifique, Paris (France).
SPOT IN THE 1980'S
M. Taizet *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 35-36 (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The SPOT development program is outlined, and information transfer, storage, and management are discussed. The SPOT satellite is programmable and is designed for continuous remote sensing activities. The first satellite should operate from 1984 until 1986, when the launching of SPOT-2 is planned. Author (ESA)

N83-14612*# National Aeronautics and Space Administration, Washington, D. C.
LAND REMOTE SENSING ACTIVITIES IN THE US
S. W. Keller and K. J. Ando *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 37-45 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The LANDSAT D system, shuttle imaging radar instruments, the thermal infrared multispectral scanner system, the shuttle multispectral infrared radiometer, and the multispectral linear array program are described. These programs will develop advanced optical and microwave sensor technologies to support

a broad spectrum of aircraft, shuttle and free flier missions for research in agriculture, geology, hydrology and geography. A broad based fundamental research effort coupled with the development of improved data acquisition and information extraction techniques is planned to improve fundamental understanding of the remote sensing process and fully exploit its capabilities. Author (ESA)

N83-14613# Consiglio Nazionale delle Ricerche, Florence (Italy). Ist. di Ricerca sulle Onde Elettromagnetiche.

ISTITUTO DI RICERCA SULLE ONDE ELETTROMAGNETICHE (IROE) MOBILE GROUND STATIONS FOR RECEIVING REMOTE SENSING DATA

V. Cappellini and P. F. Pellegrini *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 47-51 refs Prepared in cooperation with Florence Univ. (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

A transportable containerized ground station is described, and its use in the developing nations is illustrated, using Kenya as an example. The station contains equipment for analog and digital signal reception with different antennas. Data are processed by an HP 1000 minicomputer (enclosed in the container) which controls the receiving equipment and processes data. The station is being used for high resolution Meteosat image reception.

Author (ESA)

N83-14614# Food and Agriculture Organization of the United Nations, Rome (Italy).

REMOTE SENSING IN DEVELOPING COUNTRIES. FAO'S INTERNATIONAL EXPERIENCE

J. A. Howard *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 55-59 (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

The FAO remote sensing training scheme, assistance in establishing national remote sensing centers, experience of transfer of remote sensing technology to developing countries, and remote sensing of renewable resources are described. The FAO uses satellite imagery for land resources, water resources and soil surveys, forestry and wildlife monitoring, and fish location. Other projects include disaster forecasting, thematic mapping, agricultural statistics, and pasture and rangeland development.

Author (ESA)

N83-14615# Environmental Analysis and Remote Sensing, Delft (Netherlands).

THE GROUP AGROMET MONITORING PROJECT (GAMP)

A. Rosema *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 61-67 (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

The GAMP project, which uses METEOSAT data to monitor rainfall, evaporation, soil moisture, and germination in arid and semiarid regions is described. An area of the Sahelian zone of Mali was monitored in 20 X 30 km blocks using 5 climatic stations and 16 rain gages. The test period was 17 days at the beginning of the growing season. At the start of the period substantial rainfall caused germination, but the young plants were killed by a later drought. Author (ESA)

N83-14616# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Dept. of Geography.

REMOTE SENSING OF RENEWABLE NATURAL RESOURCES IN DEVELOPING COUNTRIES FOR NATIONAL PLANNING PURPOSES

Harold Haefner and Rudolf Schoch *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 69-76 refs (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

The basic needs of a developing country regarding its renewable natural resources, exploitation of remote sensing technology as an aid to resource evaluation, planning and development, applications for which remote sensing techniques are of particular use, and the most appropriate approach to solving a defined application are considered. Case studies in the Yemen Arab Republic (inventory of land use acreage, monitoring seasonal and annual changes in renewable resources, forecasting agricultural yield) are reviewed. Experience suggests that systematic, accurate, synoptic, up to date information on renewable natural resources is indispensable for development planning. Only Earth resource satellites in combination with collatoral data can provide this information. Low to intermediate level technology is recommended. Author (ESA)

N83-14617# Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).

SOME ASPECTS OF THE PRESENTATION OF REMOTE SENSING DATA

R. Haydn *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 77-80 refs (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

Problems inherent in remote sensing data transfer procedures, and processing techniques which provide improved and standardized images are discussed. Commonly available image products do not demonstrate the capabilities and applicability of multispectral satellite remote sensing techniques. They do not motivate potential users to consider remote sensing as anything other than a source of synoptic representations. Application optimized images can be obtained from intensity, hue, saturation systems and quasi-stereo effects. These data present subtle surface characteristics in a perceivable and understandable way. The processing techniques are suited for the definition of standardized enhancement schemes. Author (ESA)

N83-14618# Graz Univ. (Austria). Inst. for Image Processing and Computer Graphics.

THE APPLICABILITY OF SATELLITE REMOTE SENSING TO SMALL AND MEDIUM SCALE MAPPING

Franz W. Leberl *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 81-85 refs (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

The usefulness of satellite remote sensing images to the generation and updating of general purpose maps at scales 1: 50,000 to 1:100,000 is considered. It is argued that the needs of conventional medium and small scale mapping will not be satisfied by space imagery, unless attitudes and value systems in mapping change, or space imagery at geometric resolution of 3 m or better is available. Author (ESA)

N83-14619# Katholieke Universiteit te Leuven (Belgium). Lab. voor Bodemgenese en Bodemgeografie.

MULTITEMPORAL SOIL AND VEGETATION OBSERVATIONS BY METEOSAT OVER CENTRAL AFRICA

J. Maes, R. Gombeer, and J. D'Hoore *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 87-94 refs (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

The extent to which METEOSAT could contribute to the study of dynamic land surface features in central Africa was verified. The rain forest-humid savanna limit can be distinguished through intercomparison of multitemporal data. In the savanna area, response patterns in the visible and in the thermal infrared channel agree with soil distribution patterns. The expansion or retraction of lakes and marshes and the progress of the drying out of vegetation with the advance of the dry season was also followed.

Author (ESA)

N83-14620# Ecole Nationale Superieure des Mines, Sophia-Antipolis (France).

COMBINED USE OF DAILY THERMAL CYCLE OF METEOSAT IMAGERY AND MULTISPECTRAL LANDSAT DATA: APPLICATION TO THE BANDIAGARA PLATEAU, MALI

C. Bardinet, J. M. Monget, and Y. Patoureaux (SODETEG, Leplessis-Robinson) *In* ESA Satellite Remote Sensing for

Developing Countries Jun. 1982 p 95-101 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

Combined use of LANDSAT and METEOSAT digital data for the mapping of various lithologies in the Sahel zones is summarized. The thermal inertia maps of Meteosat are particularly good for geology, but ground resolution is too low to permit better than large scale mapping. The LANDSAT data is particularly suited to detailed small scale studies, but does not contain enough multispectral information for proper lithologic discrimination during the dry season of the Sahel zone. Author (ESA)

N83-14621# Reading Univ. (England). Dept. of Meteorology.
THE DETERMINATION OF SOIL MOISTURE BALANCES IN TROPICAL AFRICA BY SATELLITE INFRARED REMOTE SENSING: THE ATMOSPHERIC PROBLEM
G. G. Wilkinson, N. R. Ward, G. Dugdale, and J. R. Milford *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 103-110 refs Sponsored by UK Overseas Development Administration (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The technique of remote sensing of soil moisture content by thermal inertia mapping from space is examined. The problem of applying a radiometric correction to Meteosat infrared channel radiances to derive ground surface temperature is considered. A model was used to calculate clear column window channel infrared absorption. The variability of atmospheric state and of its radiative transmission from day to day was assessed using radiosonde profiles from Niamey, Niger. Results indicate that atmospheric variability requires that regular ground truth measurements be obtained for accurate use of the satellite data for soil moisture determination. Author (ESA)

N83-14622# Florence Univ. (Italy). Ist. Elettronica.
AGROECOLOGICAL CLASSIFICATION BY REMOTE SENSING TECHNIQUES
V. Cappellini, C. Conese, G. P. Maracchi, F. Miglietta, and P. Pampaloni *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 111-129 refs Prepared in cooperation with CNR, Florence (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

Temporal multispectral clustering (TMC) and radiation and land morphology automatic mapping (RM) techniques are introduced. Land use classification and inventory maps are presented. The TMC consists of a nonhierarchical cluster algorithm and a multivariate data ordination code. It separates optical scanner data according to their temporal variations. For RM, global radiation values can be obtained by an empirical relationship which depends on the solar coordinates and on the slope and exposure of an identified landscape unity. The slope of each landscape unity can be defined as the ratio between the lowest distance between two points of known elevation, and the relative height increase; its exposure is the geographical direction of this line. The RM algorithm automatically calculates these values, using a digitized contour lines data bank. Author (ESA)

N83-14623# Lund Univ. (Sweden). Lab. of Remote Sensing.
APPROACHES TO DESERTIFICATION MONITORING IN THE SUDAN
Ulf Hellden, Lenwart Olsson, and Mikael Stern *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 131-144 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

A project for the development, testing and application of environmental monitoring methods for regional studies of desertification and its control, using LANDSAT data, was formulated. Data processing using a geographical data base, population density monitoring, and land use appropriateness versus theoretically optimal land use were studied. Results indicate that LANDSAT can contribute significantly to the development of models which explain desertification status and rate as functions of physical, biological, agricultural, and socioeconomic variables. Author (ESA)

N83-14624# Copenhagen Univ. (Denmark). Inst. of Geography.
MULTITEMPORAL ANALYSIS OF LANDSAT DATA FOR INVESTIGATIONS OF AGRICULTURAL LAND USE: PROBLEMS AND POTENTIALS
Kjeld Rasmussen *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 145-151 ref Sponsored by Danish Natural Science Research Council (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The great demands on computer time, the decreased spatial resolution due to inaccuracies in digital overlay of two or more LANDSAT scenes, and the difficulties in using standard classification algorithms on multitemporal data sets are considered. Ways of minimizing these problems are mentioned, and examples drawn from a Danish crop identification study are shown. Two examples of use of multitemporal analysis in current projects in developing countries are presented. In Zambia the intensity of land use in a shifting cultivation system is being studied, and by means of multitemporal analysis the intensification process can be detected. In Kenya within and between year variations of amount and location of grazing resources are studied as a means of understanding migration patterns of pastoral nomads. Author (ESA)

N83-14625# Center for Remote Sensing, Colombo (Sri Lanka). Survey Dept.
MULTISTAGE LAND USE MAPPING AND CHANGE MONITORING IN SRI LANKA
U. Geiser, M. Sommer, H. Haefner (Eidgenoessische Tech. Hochschule, Zurich), and K. I. Itten (Eidgenoessische Tech. Hochschule, Zurich) *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 153-160 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

A 1:100,000 scale land use/land cover map series of Sri Lanka was produced. Analog interpretation of computer enhanced and bulk LANDSAT imagery, and aerial photography, based on extensive ground truth, were used in a medium technological level multistage approach. Rice yield forecasting images and forest cover change maps are presented. Author (ESA)

N83-14626# Joint Research Centre of the European Communities, Ispra (Italy).
USE OF REMOTE SENSING TECHNIQUES FOR RICE PRODUCTION FORECASTING IN WEST AFRICA (MALI AND GUINEA: NIGER-BANI PROJECT)
A. Berg and J. M. Gregoire *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 161-168 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The west African rice system under controlled submersion conditions is described, and data on visual and digital interpretation of LANDSAT images of the Mali test site are presented to show the potential and limitations of that imagery for the assessment of the harvestable areas one month before harvest. The same assessment is feasible from the interpretation of IR photographs with a six rice-class classification. Interpretation of RBV imagery acquired during the 1980 campaign allows forecasting to be extended to 3 months before harvest as a result of the recognition of the flooded areas. This indicates that the maximum extension of flooding constitutes the main limiting factor of rice production. Author (ESA)

N83-14627# Institute of Geological Sciences, Nottingham (England).
SATELLITE REMOTE SENSING IN MINERAL EXPLORATION IN DEVELOPING COUNTRIES
E. A. Stephens *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 169-170 (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

Appropriate levels of image processing and infrastructure for satellite remote sensing in mineral exploration by small developing nations are discussed. It is suggested that EARSeL has an

important role to play in undertaking research to evaluate data from the next generation of satellites on behalf of and in cooperation with developing countries. The provision of access to sophisticated image processing equipment and to experienced personnel as an alternative to the smaller developing countries investing their limited resources in remote sensing field is also important. Author (ESA)

N83-14628# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif. Imagery Data Systems.
REMOTE SENSING APPLICATIONS TO THE DEVELOPMENT OF AN INTEGRATED DATA BASE FOR OIL AND GAS EXPLORATION
Robert J. Hall *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 171-174 ref (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

Techniques employed in oil and gas exploration and the utility of satellite data to the exploration process are discussed. The application of satellite information to geologic analysis, planimetric mapping and other data collection efforts associated with the search for oil and gas are considered. Geographic information and image processing features that were utilized in three projects are outlined and the potential of data sources such as LANDSAT-D is assessed. Experience shows that satellite imagery is of greatest benefit when it is integrated into a comprehensive data base with conventional data. Author (ESA)

N83-14629# Institute of Geological Sciences, Nottingham (England).
REMOTE SENSING OF THE GRANITES OF SOUTHEAST ASIA
D. I. J. Mallick *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 175-179 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

Remote sensing using LANDSAT imagery and air photography in support of field investigations is shown to be useful in subdividing the granite bodies of the SE Asia tin belt. In many cases, however, the distinctions in chemistry and physical properties between the various phases of granite are so small that no remote sensing discrimination between them is possible. In NW Malaysia cloud cover and vegetation hamper imagery. Subdivisions of the granite bodies on the basis of morphological and vegetation variations correlate with lithological variations in the underlying granite. Most subdivisions of the more rugged, high relief and high altitude areas of granite are based on slight variations in morphology alone; the main variation in the vegetation is with altitude. Author (ESA)

N83-14630# Krueger (I.) A/S, Copenhagen (Denmark).
APPLICATION OF SATELLITE DATA TO HYDROGEOLOGICAL INVESTIGATION IN DAMAGARAM-MOUNIO, NIGER
J. P. Zafiryadis *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 181-189 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The use of satellite data in a project which will drill 300 boreholes and dig 100 wells in an area of the Sahel subject to drought is outlined. Satellite data were used to identify negative drilling zones (zones where the crystalline bedrock is overlaid by sandy formation). These negative zones can be distinguished on LANDSAT images by their reflectance. About 80% of the holes drilled outside these zones contain water. Author (ESA)

N83-14631# International Inst. for Aerial Survey and Earth Sciences, Delft (Netherlands).
SATELLITE REMOTE SENSING FOR DEVELOPING COUNTRIES: PROSPECTS AND CONSTRAINTS **c43**
Caesar Voute *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 193-200 refs (For primary document see N83-14608 05-44)
Avail: NTIS HC A11/MF A01

Prospects and constraints of satellite remote sensing are discussed, focusing on the socioeconomic conditions and development objectives of the Third World and the necessity of preserving a sociocultural identity and pluriformity. It is concluded that endogenous adaptation of remote sensing techniques and methodologies should be promoted rather than a transfer of technology. This requires normative research in addition to application and technology oriented research. Author (ESA)

N83-14632# European Space Agency, Paris (France).
SATELLITE REMOTE SENSING: ESA'S EXPERIENCE WITH DEVELOPING COUNTRIES
V. A. Hood *In its* Satellite Remote Sensing for Developing Countries Jun. 1982 p 201-204 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The data needs of developing nations, problems associated with remote sensing in Africa, Southeast Asia, and Latin America, and ESA satellite missions are discussed. METEOSAT, SPOT, the Spacelab metric camera, and ERS-1 all disseminate, or will disseminate, information to developing nations. Training programs are offered by ESA to these nations. A major criticism of cooperation projects is that the developing nations do not have enough time to assimilate and fully exploit a given program before it is replaced by a technologically more advanced one.
Author (ESA)

N83-14633# Bristol Univ. (England).
THE ROLE OF EARSEL AND EARSEL MEMBER LABORATORIES
E. C. Barrett *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 205-208 (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

The role of EARSeL in method directory publication, data pooling, task force projects (especially in model testing and development), technical advice, education and training, and definition studies for future satellite products, sensors and systems is discussed. The establishment of an EARSeL Action Group to pursue such possibilities is urged. The advantages to the European Remote Sensing Community through greater exposure to and involvment in the pragmatic problem solving which situations in developing countries particularly demand are pointed out.
Author (ESA)

N83-14634# Geological Survey of Norway, Trondheim.
DIGITAL METHODS FOR LINEAMENT ANALYSIS
B. Rindstad and B. Follestad *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 211-214 refs (For primary document see N83-14608 05-43)
Avail: NTIS HC A11/MF A01

Lineaments taken from LANDSAT images from an area covering most of Finnmark, Norway, were studied. Data programs for digitalization, statistics, plotting and gridding, run on a HP 3000 computer (2 MB core, 750 MB disk) are described. Lineaments are digitalized by the DIGLIN program. This program, written in BASIC, is operated on a graphic terminal and converted with a digitalization table. A cross-hair is placed over the point to be digitalized and for which the coordinates are required. The data as x and y coordinates as well as an identification are then transferred from band cassette to a file on the HP 3000. The program LINER converts the data to a readable file for the program LINAMENT, which calculates a directional frequency and a directional length histogram, from specified group number, lineament length and subarea. The KONTUR program provides contour maps. For Finnmarksvidda, the lineament directions were gridded and presented as contour maps, facilitating manual and digital correlation with other geodata. Author (ESA)

N83-14635# Canada Centre for Remote Sensing, Toronto (Ontario).
A PRACTICAL AUTOMATED MAPPING SYSTEM
S. Pala *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 217-218 (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

A system for the computerized production of maps directly from the digital analysis of LANDSAT data is described. The system is based on the Applicon Color Plotter, a computerized printer which plots lines, curves and polygons at any selected scale on ordinary paper measuring 86 cm by 56 cm. By using three ink jets, each applying a single basic color, the plotter prints map features in up to 256 different shades of color. The system uses a PDP 11/34 computer. It takes 2 hr to process the digital analysis results onto a tape in a format acceptable to the Applicon printer. Printing of the map can then be completed within 15 min.

Author (ESA)

N83-14636# Instituto de Investigaciones Pesqueras, Barcelona (Spain). Dept. de Oceanografia.

SPACE TRUTH IN OCEANOGRAPHY

A. Ballester and M. Garcia *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1981 p 219-223 refs (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

Validation of remotely sensed sea surface temperatures by a ground truth configured from data collected in situ is discussed. Thermal synoptic cartography data from the Spanish continental shelf were compared with Tiros-N and NOAA-6 values. The danger of comparing nonsynoptic ground truth with synoptic satellite observations is revealed. Author (ESA)

N83-14637# Oslo Univ. (Norway). Dept. of Geography.

DIGITAL ANALYSIS OF LANDSAT SATELLITE IMAGERY IN TURKANA, NORTHERN KENYA

K. O. Fredhjem *In* ESA Satellite Remote Sensing for Developing Countries Jun. 1982 p 225-226 refs (For primary document see N83-14608 05-43)

Avail: NTIS HC A11/MF A01

Digital LANDSAT scanner data was enhanced and compared with color infrared air photos. Results show that false color composite (FCC) images made from ratio or principal component bands add little new information to the information contained in the standard FCC. Best is the FCC: PC2=R, MSS5=G, and PC1=B. The FCC: MSS4/5=R, MSS6=G, and MSS5/6=P is also good. It is easier to obtain good results from the supervised than from the unsupervised classification technique. Author (ESA)

N83-14638# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

SCALE CONTROLS IN THE ALSACE-LORRAINE TRIANGLE CHAIN (1977 - 1979) [MASSSTABSKONTROLLEN IN DER ELSASS-LOTHRINGISCHEN DREIECKSKETTE (1977 - 1979)]

1981 134 p refs In GERMAN

(Ser-B-255-Mitt-162; ISSN-0071-9196) Avail: NTIS HC A07/MF A01

The scale control investigation in the Alsace-Lorraine (West Germany) triangle chain includes the topics: (1) field measurements in the Alsace-Lorraine triangle chain (1977-1979); (2) the measurement results from 1977 to 1979, and a comparison with the 1877 measurements; and (3) the Oberhergheim base (1804-1877-1979). For individual titles, see N83-14639 through N83-14641.

N83-14639# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

FIELD MEASUREMENTS IN THE ALSACE-LORRAINE TRIANGLE CHAIN (1977 - 1979) [DIE FELDMESSUNGEN IN DER ELSASS-LOTHRINGISCHEN-DREIECKSKETTE (1977 - 1979)]

Hansdieter Grosse *In its* Scale Controls in the Alsace-Lorraine Triangule Chain (1977 - 1979) refs In GERMAN (For primary document see N83-14638 05-43)

Avail: NTIS HC A07/MF A01

Field measurements (scale controls) between Saarbrucken and Basel, making the connection to France, were performed in order to obtain a good description of the German Alsace-Lorraine triangle chain. The scale controls were done by means of electromagnetic rangefinding measurements. Meteorological influences and radio interference are discussed. All measuring instruments proved to be satisfactory considering the weather conditions. Difficulties occurred occasionally with the tellurometer measurement and with the reading of the devices on the cathode ray tube, decreasing the accuracy. A microwave system would be preferable. Author (ESA)

N83-14640# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE MEASUREMENT RESULTS FROM 1977 TO 1979 AND A COMPARISON WITH THE 1877 MEASUREMENTS [DIE MESSERGEBNISSE VON 1977 BIS 1979 UND EIN VERGLEICH MIT DEN MESSUNGEN VON 1877]

Otfried Wolfrum *In its* Scale Controls in the Alsace-Lorraine Triangle Chain (1977 - 1979) 1981 p 29-38 refs In GERMAN (For primary document see N83-14638 05-43)

Avail: NTIS HC A07/MF A01

The direction measurements in the Alsace-Lorraine triangle chain performed in 1877 by the Koniglich Preussischen Landesvermessung (Royal Prussian ordnance survey service) were adjusted, using measurements made by the Technical Highschool of Darmstadt. The corrections were made, using the calculation programs ADGECO and TRINA. The results show an average scale error of the chain of + 1.7 mm/km; the Oberhergheim base longitude was measured too high by 34 mm and 4.6 mm/km, respectively. Author (ESA)

N83-14641# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

THE OBERHERGHEIM BASE (1804 - 1877 - 1979) [DIE BASIS OBERHERGHEIM (1804 - 1877 - 1979)]

Hansdieter Grosse *In its* Scale Controls in the Alsace-Lorraine Triangle Chain (1977 - 1979) 1981 p 36-69 refs In GERMAN (For primary document see N83-14638 05-43)

Avail: NTIS HC A07/MF A01

Ordnance surveys of the Oberhergheim base (Alsace-Lorraine) were carried out in 1979 in order to check the 1804 and 1876 measurements. The Oberhergheim base is of supra-regional importance for France, West Germany, and Switzerland. A contradiction of 32 cm between the 1804 and 1876 basic measurements, which repeatedly led to elimination in the calculations of the 1.0. grid, is clarified. In the age of high precision electromagnetic rangefinding instruments, this control has predominantly an historical meaning. Author (ESA)

N83-14642# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

REPORTS ON CARTOGRAPHY AND GEODESY, SERIES 1: ORIGINAL REPORTS, NUMBER 87 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN, REIHE 1: ORIGINALBEITRAGE NR. 87]

1982 67 p refs In GERMAN; ENGLISH summary

(ISSN-0469-4236) Avail: NTIS HC A04/MF A01

This volume contains the reports: (1) map production problem in Brandenburg Prussia (description of map production in the 18th century); and (2) investigations and results of automatic and interactive line following (a method for the vectorization of line copy of continuous-tone imagery for cartographic data banks). For individual titles, see N83-14643 through N83-14644.

N83-14643# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).

MAP PRODUCTION PROBLEMS IN BRANDENBURG-PRUSSIA [PROBLEME DER LANDKARTENPRODUKTION IN BRANDENBURG-PREUSSEN]

Eckhard Jaeger *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept. No. 87 1982 p 5-45 refs In GERMAN; ENGLISH summary (For primary document see N83-14642 05-43)

Avail: NTIS HC A04/MF A01

Map production in 18 th century Brandenburg-Prussia is described. Until the middle of the 18 th century, the Brandenburg March and the later Prussian Monarchy hardly produced any maps of their own. From 1753 onwards, by virtue of Royal Privilege,

autonomous map production began to establish itself within the Prussian Academy of Sciences which, in the course of the second half of the century, made Berlin besides Nurnberg and Augsburg a cartographic center. By means of the publication of Prussian maps, the role of the Academy and Realschule as map producers as well as the activities of individual cartographers, including public-utility map production, were investigated. Author (ESA)

N83-14644# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
INVESTIGATIONS AND RESULTS OF AUTOMATIC AND INTERACTIVE LINE FOLLOWING [UNTERSUCHUNG UND ERGEBNISSE ZUR AUTOMATISCHEN UND INTERAKTIVEN LINIENVERFOLGUNG]
Bernd-Siegfried Schulz *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept. No. 87 1982 p 47-69 refs In GERMAN; ENGLISH summary (For primary document see N83-14642 05-43)
Avail: NTIS HC A04/MF A01

A method for the vectorization of line copy or continuous-tone imagery, largely cleared from noise and transformed into edge images, by means of line following, is presented and verified by way of examples. A preprocessing step serves for closing gaps automatically as well as for erasing inadmissible line connections interactively. After the determination of starting points sections of uninterrupted lines are followed automatically, larger gaps are at first progressively closed in a linear way by the determination of targets and then followed. Vectorized lines are erased on the screen so that the actual state of work is visible at any time.
Author (ESA)

N83-14645# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY, SERIES 1: ORIGINAL REPORTS, NUMBER 88 [NACHRICHTEN AUS DEM DARTEN- UND VERMESSUNGSWESEN, REIHE 1: ORIGINALBEITRAEGE, NR. 88]
1982 190 p refs In GERMAN; ENGLISH summary Original contains color illustrations
(ISSN-0469-4236) Avail: NTIS HC A09/MF A01

This volume contains the reports: (1) PLATEX: an attempt at batch-oriented placement of names on maps; (2) spectrum analytical considerations of digitizing in vector format; (3) a raster data processing method for contour line digitizing; (4) automation aided generalization (legibility of maps); and (5) raster data processing in cartography. For individual titles, see N83-14646 through N83-14650.

N83-14646# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PLATEX: AN ATTEMPT AT BATCH-ORIENTED PLACEMENT OF NAMES ON MAPS [PLATEX: EIN VERSUCH ZUR BATCH-ORIENTIERTEN ANORDNUNG VON KARTENNAMEN]
Ernst-Ulrich Fischer *In its* Rept. on Cartography and Geodesy, Ser. 1: Originial Rept., No. 88 1982 p 5-41 refs In GERMAN; ENGLISH summary Original contains color illustrations (For primary document see N83-14645 05-43)
Avail: NTIS HC A09/MF A01

A method for batch-oriented name placement in topographical mapping is described and verified with two examples. The procedure is a synthesis of raster and vector approach in computer assisted cartography. The computer program PLATEX used in this procedure is described in detail. Examples show that a success rate of 60% is obtained, and the interactive processing part can consequently be accelerated. The procedure is not fully automatic, but is fast and without problems for this application. Author (ESA)

N83-14647# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SPECTRUM ANALYTICAL CONSIDERATIONS OF DIGITIZING IN VECTOR FORMAT [SPEKTRALANALYTISCHE BETRACHTUNGEN UEBER DIAITALISIERUNGEN IM VEKTORFORMAT]
Ernst-Ulrich Fischer *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 88 1982 p 41-59 refs In GERMAN; ENGLISH summary (For primary document see N83-14645 05-43)
Avail: NTIS HC A09/MF A01

Fundamental properties of the spectra of physically relizable, sampled signals of finite duration are dealt with. The theory is applied to digitizing on vector-oriented cartographic systems. Compared to previous theories, only a few coefficients have to be modified. The method only requires the setting of the correct scanning frequency for digitizing, and not the digital filter design. In this sense, the procedure is a contribution to the practical work of the cartographer in the cartographic automation system.
Author (ESA)

N83-14648# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A RASTER DATA PROCESSING METHOD FOR CONTOUR LINE DIGITIZING [HOEHENLINIENDIGITALISIERUNG NACH VERFAHREN DER RASTER-DATENVERARBEITUNG]
Matthias Giebels and Wigand Weber *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 88 1982 p 61-75 refs In GERMAN; ENGLISH summary (For primary document see N83-14645 05-43)
Avail: NTIS HC A09/MF A01

A raster data processing procedure of contour line digitizing is presented. The basic idea of the procedure is the successive coloring of the hypsometric layers, starting out from interactively marked low terrain points. Contrary to the conventional procedure of contour line digitizing, the method allows not only the acquisition of the contours, but also the assignment of the heights according to methods of raster data processing. This way it becomes possible to profit of the topology proper to the contours as well as of the hierarchic structure of the contours. Gaps even of considerable size do not disturb this method. Author (ESA)

N83-14649# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AUTOMATION AIDED GENERALIZATION [AUTOMATIONSGESTUETZTE GENERALISIERUNG]
Wigand Weber *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., No. 88 1982 p 77-109 refs In GERMAN; ENGLISH summary (For primary document see N83-14645 05-43)
Avail: NTIS HC A09/MF A01

Batch generalization procedures which after an introductory definition of global generalization parameters on the part of the cartographer are realized from start to finish without any human interferences are described. The procedures of batch generalization can be divided into three categories resulting from the method applied: information oriented generalization, filter oriented generalization, and heuristic generalization. Among these three categories the information oriented generalization is probably the one which can best be proven conceptually, but the most difficult one to realize computationally. To the heuristic generalization applies exactly the opposite while the filter oriented generalization takes an intermediate position. Author (ESA)

N83-14650# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
RASTER DATA PROCESSING IN CARTOGRAPHY [RASTERDATENVERARBEITUNG IN DER KARTOGRAPHIE]
Wigand Weber *In its* Rept. on Cartography and Geodesy, Ser. 1: Original Rept., no. 88 1982 p 111-190 refs In GERMAN; ENGLISH summary (For primary document see N83-14645 05-43)
Avail: NTIS HC A09/MF A01

Cartographic raster data processing is described. It is divided into four characteristic successive phases, namely: digitizing, storage of digitized data in a raster data base, variation of the raster data by means of raster operations which are implemented as algorithms on appropriate computer hardware, and output of the ready data from the computer in graphical form by means of a raster plotter. These different aspects are described. Sufficient examples of application and information, concerning economic aspects of the procedures dealt with are given to facilitate the reader's decision whether automation assisted raster data processing of cartographic data is useful for him or not. Author (ESA)

N83-14651# Army Engineer Topographic Labs., Fort Belvoir, Va.
A PROTOTYPE GEOGRAPHIC NAMES INPUT STATION FOR THE DEFENSE MAPPING AGENCY
Douglas R. Caldwell, Robert F. Augustine, and Diane E. Strife 28 Aug. 1982 11 p
(AD-A119299; ETL-R041) Avail: NTIS HC A02/MF A01 CSCL 08/6

The collection, maintenance, and distribution of geographic place names information at the Defense Mapping Agency is accomplished through the Foreign Place Names File, an index card data base. An attempt to automate the file is currently underway, starting with the development of a prototype Geographic Names Input Station. In the short term, the station will be integrated with the gazetteer production flow and will be used to enter, process, and display Roman script foreign text information. Its more important long-term role, however, will be to serve as a testbed for the development of an all digital Foreign Place Names Information System. Author (GRA)

N83-14652# Army Engineer Topographic Labs., Fort Belvoir, Va.
DIGITAL TERRAIN ANALYSIS STATION (DTAS)
Michael R. Thompson and Robert M. Socher 28 Aug. 1982 12 p
(AD-A119298; ETL-R040) Avail: NTIS HC A02/MF A01 CSCL 08/2

Battlefield commanders in today's Army need timely, accurate terrain analyses. Modern tactical realities do not give the commander time for manual preparation of map overlays and other graphic products from varied and voluminous sources. The commander must have up-to-date graphic displays and overlays highlighting tactically vital terrain features and battle/combat advantages resulting from terrain configurations. These factors, combined with the advances in computer technology and data base management, indicate that a computer-assisted terrain analysis capability is feasible and needed by the Army. The terrain analysis capabilities of the DTAS produce graphic products that fall generally into two major areas: Intervisibility and Mobility. The products may be displayed on the DTAS viewing screens or drawn to scale on the DTAS plotter. They may stand alone or be used in compiling other products. The intervisibility capabilities are used to determine areas that are visible, either optically or electronically, from a given site. These capabilities have the user-selectable option of including vegetation heights in the analysis. The mobility capabilities are used to evaluate the potential effects of terrain upon friendly and enemy operations. GRA

N83-14653# Army Engineer Topographic Labs., Fort Belvoir, Va.
EFFECTS OF GROUND COVER AND LEAF AREA ON THE SPECTRAL REFLECTANCE OF VEGETATION-SOIL TARGET
Melvin B. Satterwhite and Ponder Henley 23 Sep. 1982 12 p refs
(AD-A119714; ETL-R039) Avail: NTIS HC A02/MF A01 CSCL 20/6

The relations between spectral reflectance, percent ground cover, and leaf area index (LAI) for vegetation-soil targets were evaluated for green vegetation against either a light-toned sand and a dark-toned organic loam soil. The percent ground cover and LAI were calculated for the ground area in the radiometer's field of view. The special reflectances of the different targets were measured in the 400 to 1100 nm region. For the vegetation-organic loam targets, the present cover and LAI varied directly with the target reflectance in the green (520-600 nm) and the infrared (700-1100 nm) regions, but varied inversely with reflectance in the red region (650-700 nm). For the vegetation-sand targets, the percent cover and LAI varied inversely with reflectance in the visible region and directly in the IR region. Results show that the major change in reflectance of vegetation-soils was related more to the change in percent cover. For less than 100 percent cover, the LAI varied directly with percent ground cover. A change in LAI produced less change in target reflectance than did a change in percent cover. Once the canopy is closed, i.e., 100 percent cover, variation in LAI had little effect. Author (GRA)

N83-14654# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE IMPACT OF CLIMATOLOGICAL VARIABILITY ON SURFACE WATER SUPPLY IN OKLAHOMA M.S. Thesis
Charles Christian Olsen 1982 231 p refs
(AD-A119723; AFIT/CI/NR/82-51T) Avail: NTIS HC A11/MF A01 CSCL 08/8

The frequency and duration of surface water deficits in two river basins in western Oklahoma and the Texas Panhandle are examined for the thirty years, 1951-1980. The studied basins were divided into a total of 10 subbasins. A hydrologic accounting system, using precipitation and temperature as inputs, was used to derive variables such as potential (PET) and actual (ET) evapotranspiration, soil moisture and runoff. These were combined with basic hydrologic variables (stream discharge and lake contents) to calculate long-term weekly mean values and 75 percent empirical ranges for surface water storage and demand. Potential deficit periods were identified and examined using percentage frequency histograms and joint frequency tables. From these it was determined that surface water deficits existed in as many as 47 percent of the thirty years studied. The potential deficit period ranged from 2 weeks to 29 weeks, averaging 17 weeks. Case studies for two of the subbasins for a dry year, a wet year and an 'average' year are presented. Background climatologies for weekly precipitation (30-year means and means for the 5 driest years), weekly stream discharge and weekly lake contents for each of the ten major river basins in Oklahoma are presented. GRA

N83-14655# Army Engineer Topographic Labs., Fort Belvoir, Va.
SPECIAL REFLECTANCE OF SOME PLANT INDICATORS OF SALINE AND NONSALINE SOILS
Melvin B. Satterwhite and John W. Eastes 23 Sep. 1982 12 p refs
(AD-A119727; ETL-R038) Avail: NTIS HC A02/MF A01 CSCL 20/6

The task of finding a water supply in an arid region and determining something of its potability can be aided by using various remote sensing techniques for gathering geological, botanical, and terrain data. The objective of this study was to determine if salt-tolerant and salt-intolerant plant species could be distinguished by some unique spectral bandpass in the 0.4 to 1.1 micrometers spectral region. A number of study sites in Nevada having either salt-tolerant or intolerant plant species were selected. Spectral measurements were made on six salt-tolerant and two salt-intolerant species during June-July when the plants were in full vegetative stage and not under any apparent water deficit stress. The reflectance spectra of the halophyte and nonhalophyte species showed that they could not be differentiated using selected bandpasses because the spectral characteristics (intensity and wavelength range) were too similar for both groups. Comparison of individual spectra showed some salt-tolerant and intolerant species could be distinguished by their reflectance spectra. Even so, different species occupying similar landform conditions had similar spectral reflectance signatures. The canopy geometry and background were important factors affecting these spectral signatures. Author (GRA)

N83-14656# Naval Surface Weapons Center, Dahlgren, Va.
AN UPPER BOUND ON ERRORS IN THE MEAN-OF-DATE/INSTANTANEOUS EARTH-FIXED VECTOR TRANSFORMATION INDUCED BY INTERPOLATED NUTATION ANGLES Final Report
A. D. Parks Jun. 1982 19 p
(AD-A119444; NSWC/TR-82-75) Avail: NTIS HC A02/MF A01 CSCL 12/1

An analytic expression for the upper bound on the error induced into a vector modulus by the use of interpolated nutation angles in the coordinate transformation between the mean-of-date reference system and the instantaneous Earth-fixed reference system is derived through first order. This expression is applied to the six-point Lagrange interpolator, using interpolation intervals between 0.25 and 1.00 days, and a quantification of associated upper error bounds for Earth satellite position vector moduli is made. Author (GRA)

N83-14657# California Univ., Livermore. Lawrence Livermore Lab.
IN-SITU FRACTURE MAPPING USING GEOTOMOGRAPHY AND BRINE TRACERS
F. J. Deadrick, A. L. Ramirez, and R. J. Lytle 1981 4 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21-23 Oct. 1981
(Contract W-7405-eng-48)
(DE82-002101; UCRL-85712; CONF-811012-12) Avail: NTIS HC A02/MF A01

The capabilities of high resolution geophysical methods to characterize geologic sites for the disposal of high level nuclear waste. Salt water tracers and high frequency electromagnetic waves were utilized to map rock mass fracture zones in-situ. Multiple cross borehole EM transmissions generated a tomographic image of the fractured rock region between two boreholes. The tomographs obtained correlate well with conventional wireline geophysical logs which can be used to infer the location of fractured zones in the rock mass. It is suggested that the geotomography and brine tracer technique may have merit in mapping fractured zones between boreholes. DOE

N83-14658# California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
AN INTEGRATED MODEL FOR THE NATURAL FLOW REGIME IN THE CERRO PRIETO HYDROTHERMAL SYSTEM, B.C., MEXICO, BASED UPON PETROLOGICAL AND ISOTOPE GEOCHEMICAL CRITERIA
Wilfred A. Elders, Alan E. Williams, and J. R. Hoagland 1981 7 p refs Presented at the 3rd Symp. on the Cerro Prieto Geothermal Field in Baja California, Mexico, San Francisco, Mar. 1981
(Contract DE-AT03-80SF-11458)
(DE82-001980; CONF-810399-3) Avail: NTIS HC A02/MF A01

Studies of cuttings and core at Cerro Prieto have now been extended to more than 50 boreholes. The aims of this petrological and isotopic work are to determine the shape of the reservoir, its physical properties, and its temperature distribution and flow regime before the steam field was produced. A map showing the first occurrence of hydrothermal epidote shows a dome shaped top to the steam producing zone. The hottest of the mapped mineral zones - the biotite vermiculite zone - shows a dome displaced to the northeast relative to the epidote zone. Patterns of mineral zones observed in wells are consistent with patterns of oxygen isotopic ratios in calcite and quartz. Using both criteria all of the boreholes so far studied were classified as belonging to one of four different regimes. DOE

N83-14659# New Mexico Univ., Albuquerque.
ZICONOLITES FROM SRI LANKA, SOUTH AFRICA AND BRAZIL
Rodney C. Ewing, Richard F. Haaker, Thomas J. Headley (Sandia National Labs.), and Paul F. Hlava (Sandia National Labs.) 1981 8 p refs Presented at the Ann. Meeting of the Mater. Res. Soc., Boston, 16 Nov. 1981
(Contract DE-AC04-76D-00789)
(DE82-001908; SAND-81-2171C; CONF-811122-3) Avail: NTIS HC A02/MF A01

Zirconolines, $CaZrTi_2O_7$, from Sri Lanka and Pala Bora, South Africa, and a calzirtite, $CaZr_3TiO_9$, from Jacupiranga, Brazil, were examined using the electron microprobe, X-ray diffraction (annealing study), transmission electron microscopy, scanning electron microscopy and optical microscopy. The X-ray data indicate that all three zirconolites are metamict. Both Sri Lanka zirconolites are amorphous to the limits of resolution of the electron microscope (approximately 10 A). The Pala Bora zirconolite is largely amorphous but contains isolated domains (50 to 200 A) of crystalline material which may be the result of post metamict recrystallization and alteration. The only other significant evidence for chemical alteration was the lower ThO_2 concentration (1 to 2 weight percent) and slightly lower analytic totals for the rims of the Sri Lanka zirconolites. Upon annealing at 1130 C for 5 hours, all three zirconolites recrystallized as microcrystalline aggregates. DOE

N83-14660# California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
DATING THERMAL EVENTS AT CERRO PRIETO USING FISSION-TRACK ANNEALING
Steven J. Sanford and Wilfred A. Elders 1981 5 p refs Presented at the 3rd Symp. on the Cerro Prieto Geothermal Field in Baja California, Mexico, San Francisco, Mar. 1981
(Contract DE-AT03-80SF-11458)
(DE82-001979; CONF-810399-4) Avail: NTIS HC A02/MF A01

The duration of heating in the Cerro Prieto reservoir was estimated by relating the fading of spontaneous fission tracks in detrital apatitie to observed temperatures. The rate of fading is a function of both time and temperature. The apparent fission track age of the detrital apatites then , is a function of both their source age and their time-temperature history. Data from laboratory experiments and geologic fading studies were compiled from published sources to produce lines of iso-annealing for apatite in time-temperature space. Fission track ages were calculated for samples from two wells at Cerro Prieto, one with an apparently simple and one with an apparently complex thermal history. Temperatures were estimated by empirical vitrinite reflectance geothermometry, fluid inclusion homogenization and oxygen isotope equilibrium. These estimates were compared with logs of measured borehole temperatures. DOE

N83-14661# California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
USE OF WIRELINE LOGS AT CERRO PRIETO IN IDENTIFICATION OF THE DISTRIBUTION OF HYDROTHERMALLY ALTERED ZONES AND DIKE LOCATIONS AND THEIR CORRELATION WITH RESERVOIR TEMPERATURES
D. Taylor Seamount, Jr. and Wilfred A. Elders 1981 6 p refs Presented at the 3rd Symp. on the Cerro Prieto Geothermal Field in Baja California, Mexico, San Francisco, Mar. 1981
(Contract DE-AT03-80SF-11458)
(DE82-001981; CONF-810399-5) Avail: NTIS HC A02/MF A01

Downhole electrical and gamma-gamma density logs from nine wells were studied and the wireline log parameters with petrologic, temperature, and petrophysical data were correlated. Wells M-43, T-366, and M-107 are discussed as typical cases. Log data for shales show good correlation with four zones of hydrothermal alteration previously recognized on the basis of characteristic mineral assemblages and temperatures. DOE

N83-14934# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
APPLICATION OF RELATIVE COORDINATES IN HYDRODYNAMICS
R. H. Multer *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 123-136 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08/8

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N83-14662 Minnesota Univ., Minneapolis.
DESIGN OF PLYWOOD AND PAPER FLYWHEEL ROTORS Ph.D. Thesis
David LeRoy Hagen 1982 197 p
Avail: Univ. Microfilms Order No. DA8221276

Technical and economic design factors of cellulosic rotors are

compared with conventional materials for stationary flywheel energy storage systems. Wood species, operation in a vacuum, assembly and costs of plywood rotors are evaluated. Wound kraft paper, twine and veneer rotors are examined. Two bulb attachments are designed. Support stiffness is shown to be constrained by the material strength, rotor configuration and speed ratio. Plywood moisture equilibrium during manufacture and assembly is critical. Disk shaping and rotor assembly are described. Potential self-centering dynamic balancing methods and equipment are described. Detailed measurements of the distribution of strengths, densities and specific energy of conventional Finnish Birch plywood and of custom made hexagonal Birch plywood are detailed. High resolution tensile tests were performed while monitoring the acoustic emissions with micoprocessor controlled data acquisition. Preliminary duration of load tests were performed on vacuum dried hexagonal birch plywood. Economics of cellulosic and conventional rotors were examined. Dissert. Abstr.

N83-14663 Clarkson Coll. of Technology, Potsdam, N.Y.
MOMENTUM AND HEAT TRANSFER IN THE TURBULENT BOUNDARY LAYER NEAR A ROTATING DISK Ph.D. Thesis
Safwat Ebeid Tadros 1982 189 p
Avail: Univ. Microfilms Order No. DA8219893

A combined numerical and experimental study was conducted to describe the velocity and temperature fields in the air moving near the surface of a heated rotating disk. Sufficiently mild heating is assumed such that the velocity and the heat transfer problems are decoupled. The velocity field in the turbulent boundary layer is determined using a model suggested by Cebeci and Abbott. Numerical results from this model are combined with experimental data to develop appropriate similarity laws for both the main and cross flow velocity components. Heat transfer from an axisymmetric, ring shaped heat source at the surface of a rotating disk, including the limiting case of a heated disk, is obtained numerically for the laminar, transitional, and turbulent regions of the boundary layer. The results agreed very well with existing experimental correlations, in particular the 1/3 power law relating the surface heat flux and the wall shear stress is found to be valid in both laminar and turbulent flow regimes. Dissert. Abstr.

N83-14664# General Accounting Office, Washington, D. C.
DEVELOPING ALASKA'S ENERGY RESOURCES: ACTIONS NEEDED TO STIMULATE RESEARCH AND IMPROVE WETLANDS PERMIT PROCESSING
17 Jun. 1982 93 p refs
(GAO/EMD-82-44; B-204637) Avail: NTIS HC A05/MF A01; SOD HC $3.25

A need for additional Arctic research is identified and changes in the Corps of Engineers' wetlands permitting process are called for. This review was conducted to determine the effectiveness of Federal agencies' efforts to minimize the negative environmental impacts of oil and gas-related activities on Federal lands in Alaska. L.F.M.

N83-14665*# Westinghouse Research and Development Center, Pittsburgh, Pa.
LARGE-AREA SHEET TASK ADVANCED DENDRITIC WEB GROWTH DEVELOPMENT Quarterly Report, 24 Oct. - 31 Dec. 1981
C. S. Duncan, R. G. Seidensticker, J. P. McHugh, R. H. Hopkins, D. Meier, and J. Schruben 18 Jun. 1982 23 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955843)
(NASA-CR-169624; DOE/JPL-955843-82/5; NAS 1.26:169624) Avail: NTIS HC A02/MF A01 CSCL 10A

The thermal stress model was used to generate the design of a low stress lid and shield configuration, which was fabricated and tested experimentally. In preliminary tests, the New Experimental Web Growth Facility performed as designed, producing web on the first run. These experiments suggested desirable design modifications in the melt level sensing system to improve further its performance, and these are being implemented. Author

N83-14666*# AiResearch Mfg. Co., Los Angeles, Calif.
A HIGH TEMPERATURE CERAMIC HEAT EXCHANGER ELEMENT FOR A SOLAR THERMAL RECEIVER Final Report
Hal J. Strumpf, David M. Kotchick, and Murray G. Coombs 23 Mar. 1982 114 p refs Prepared for JPL
(NASA-CR-169625; NAS 1.26:169625; Rept-81-18452) Avail: NTIS HC A06/MF A01 CSCL 10A

The development of a high-temperature ceramic heat exchanger element to be integrated into a solar receiver producing heated air was studied. A number of conceptual designs were developed for heat exchanger elements of differing configuration. These were evaluated with respect to thermal performance, pressure drop, structural integrity, and fabricability. The final design selection identified a finned ceramic shell as the most favorable concept. The shell is surrounded by a larger metallic shell. The flanges of the two shells are sealed to provide a leak-tight pressure vessel. The ceramic shell is to be fabricated by a innovative combination of slip casting the receiver walls and precision casting the heat transfer finned plates. The fins are bonded to the shell during firing. The unit is sized to produce 2150 F air at 2.7 atm pressure, with a pressure drop of about 2 percent of the inlet pressure. This size is compatible with a solar collector providing a receiver input of 85 kw(th). Fabrication of a one-half scale demonstrator ceramic receiver was completed. Author

N83-14667*# Case Western Reserve Univ., Cleveland, Ohio.
ELECTROMAGNETIC STUDIES OF REDOX SYSTEMS FOR ENERGY STORAGE Annual Report, Dec. 1981 - Nov. 1982
Cherng-Dean Wu, Daniel Scherson, and Ernest Yeager Nov. 1981 69 p refs
(Grant NAG3-219)
(NASA-CR-169593; NAS 1.26:169593; Rept-2) Avail: NTIS HC A04/MF A01 CSCL 10C

Both chromium and iron couples were studied on various electrode surfaces in acidic perchlorate solution by using rotating ring-disk techniques. It was found that chloride which forms inner sphere coordination complexes with the redox species enhances the electrode kinetics dramatically. The effects of lead underpotential deposition and surface alloy formation on the kinetics of the chromium couple on gold were studied using both linear sweep voltammetry and potential step techniques. The lad underpotential deposition was found to slow down the kinetics of the reduction of the Cr species on gold surfaces although increase the hydrogen overvoltage. The effect on the chromium kinetics can be explained in terms of principally a double layer effect. The underpotential deposition lead species with its positive charge results in a decrease in the concentration of the Cr species at the electrode surface. Similar phenomena were also observed with bismuth underpotential deposition on gold for the iron couple. R.J.F.

N83-14668*# Solarelectronics, Inc., Bellingham, Mass.
INVESTIGATION OF THE HYDROCHLORINATION OF Sc4 Quarterly Report, 9 Jul. - 8 Oct. 1982
Jeffrey Y. P. Mui 15 Oct. 1982 26 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956061)
(NASA-CR-169621; DOE/JPL-956061-5; NAS 1.26:169621; QR-5) Avail: NTIS HC A03/MF A01 CSCL 10A

The hyrochlorination of SiC14 and m.g. silicon metal to produce SiHC13, was investigated. Reaction kinetic measurements were carried out to collect additional rate data at 525 C and 550 C. A theoretical study was carried out to provide a kinetic model and a rate equation for the hydrochlorination reaction. Results of this preliminary study show that the rate of formation of SiHC13 follows a pseudo first order kinetics. The rate constants were measured at three temperatures, 550 C, 500 C and 450 C, respectively. The activation energy was determined from the Arrhenius plot to give a value of 13.2 Kcal/mole. The design of a quartz reactor to measure reaction rates and equilibrium conversion of SiHC13 at reaction temperature up to 650 C was completed. J.M.S.

N83-14669*# Westinghouse Research and Development Center, Pittsburgh, Pa.

LARGE-AREA SHEET TASK ADVANCED DENDRITIC WEB GROWTH DEVELOPMENT Quarterly Report, 1 Apr. - 30 Jun. 1982

C. S. Duncan, R. G. Seidensticker, J. P. McHugh, R. H. Hopkins, D. Meier, and J. Schruben 17 Sep. 1982 40 p refs Sponsored in part by DOE Prepared for JPL

(Contract JPL-955843)

(NASA-CR-169639; DOE/JPL-955843-82/7; NAS 1.26:169639) Avail: NTIS HC A03/MF A01 CSCL 10A

The computer code for calculating web temperature distribution was expanded to provide a graphics output in addition to numerical and punch card output. The new code was used to examine various modifications of the J419 configuration and, on the basis of the results, a new growth geometry was designed. Additionally, several mathematically defined temperature profiles were evaluated for the effects of the free boundary (growth front) on the thermal stress generation. Experimental growth runs were made with modified J419 configurations to complement the modeling work. A modified J435 configuration was evaluated.

Author

N83-14670*# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.

INVESTIGATION OF RELIABILITY ATTRIBUTES AND ACCELERATED STRESS FACTORS ON TERRESTRIAL SOLAR CELLS Summary Report

J. W. Lathrop Jun. 1982 91 p refs Sponsored in part by DOE Prepared for JPL

(Contract JPL-954929)

(NASA-CR-169620; DOE/JPL-954929-82/9; NAS 1.26:169620) Avail: NTIS HC A05/MF A01 CSCL 10A

The accelerated stress test results obtained on all terrestrial solar cells since the inception of the program are summarized. Tested cells were grouped according to the method used to form the conductive metallization layer: solder dipped, vacuum deposited, screen printed, and copper plated. Although metallization systems within each group were quite similar, they differed in numerous details according to the procedures employed by each manufacturer. Test results were summarized for all cells according to both electrical degradation and catastrophic mechanical changes. These results indicated a variability within each metallization category which was dependent on the manufacturer. Only one manufacturer was represented in the copper plated category and, although these showed no signs of detrimental copper diffusion during high temperature testing, their metallization was removed easily during high humidity pressure cooker testing. Preliminary testing of encapsulated cells showed no major differences between encapsulated and unencapsulated cells when subjected to accelerated testing.

Author

N83-14671*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.

LOW COST SOLAR ARRAY PROJECT CELL AND MODULE FORMATION RESEARCH AREA: PROCESS RESEARCH OF NON-CZ SILICON MATERIAL Quarterly Report, 1 Jun. - 31 Aug. 1982

[1981] 33 p

(Contract JPL-955909)

(NASA-CR-169632; NAS 1.26:169632; DOE/JPL-955909-82-7; TME-3158; DRL-157; DRD-SE-2; QR-7) Avail: NTIS HC A03/MF A01 CSCL 10A

Liquid diffusion masks and liquid applied dopants to replace the CVD Silox masking and gaseous diffusion operations specified for forming junctions in the Westinghouse baseline process sequence for producing solar cells from dendritic web silicon were investigated. The baseline diffusion masking and drive processes were compared with those involving direct liquid applications to the dendritic web silicon strips. Attempts were made to control the number of variables by subjecting dendritic web strips cut from a single web crystal to both types of operations. Data generated reinforced earlier conclusions that efficiency levels at least as high as those achieved with the baseline back junction formation process can be achieved using liquid diffusion masks and liquid dopants. The deliveries of dendritic web sheet material and solar cells pecified by the current contract were made as scheduled.

Author

N83-14672*# Spectrolab, Inc., Sylmar, Calif.

DEVELOPMENT OF METALLIZATION PROCESS, FSA PROJECT, CELL AND MODULE FORMATION RESEARCH AREA Quarterly Technical Report

Alexander Garcia, III Aug. 1982 16 p

(Contract JPL-956205)

(NASA-CR-169634; NAS 1.26:169634; DOE/JPL-956705-1; DRL-175; QTR-6329-3) Avail: NTIS HC A02/MF A01 CSCL 10A

Various Mo/Sn screen printing pastes were scheduled for evaluation. Cells are first prefired in air and then fired in a H2 atmosphere. Preliminary results are encouraging.

Author

N83-14673*# Hemlock Semiconductor Corp., Mich.

DEVELOPMENT OF A POLYSILICON PROCESS BASED ON CHEMICAL VAPOR DEPOSITION, PHASE 1 Quarterly Progress Report, 1 Apr. - 30 Jun. 1981

F. Plahutnik, A. Arvidson, and D. Sawyer 5 May 1982 25 p refs

(Contract JPL-955533)

(NASA-CR-169633; NAS 1.26:169633; DOE/JPL-955533-81-7; QPR-7) Avail: NTIS HC A02/MF A01 CSCL 10A

The goal of this program is to demonstrate that a dichlorosilane-based reductive chemical vapor deposition (CVD) process is capable of producing, at low cost, high quality polycrystalline silicon. Physical form and purity of this material will be consistent with LSA material requirements for use in the manufacture of high efficiency solar cells. Four polysilicon deposition runs were completed in an intermediate size reactor using dichlorosilane fed from 250 pound cylinders. Results from the intermediate size reactor are consistent with those obtained earlier with a small experimental reactor. Modifications of two intermediate size reactors were completed to interface with the dichlorosilane process demonstration unit (PDU).

B.W.

N83-14674*# Ross (Bernd) Associates, San Diego, Calif.

DEVELOPMENT OF AN ALL-METAL THICK FILM COST EFFECTIVE METALLIZATION SYSTEM FOR SOLAR CELLS Interim Report, May 1980 - Aug. 1981

Bernd Ross and Joseph Parker Jul. 1982 92 p refs Sponsored in part by DOE Prepared for JPL

(NASA-CR-169635; DOE/JPL-955688-81/5; NAS 1.26:169635; DRD-SE-6; Rept-9950-742) Avail: NTIS HC A05/MF A01 CSCL 10A

Electrodes made with pastes produced under the previous contract were analyzed and compared with raw materials. A needle-like structure observed on the electroded solar cell was identified as eutectic copper-silicon, a phase considered to benefit the electrical and metallurgical properties of the contact. Electrodes made from copper fluorocarbon and copper silver fluoride also contained this phase but had poor adhesion. A liquid medium, intended to provide transport during carbon fluoride decomposition was incorporated into the paste resulting in better adhesion. The product survived preliminary environmental tests. A 2 cm by 2 cm solar cell made with fluorocarbon activated copper electrodes and gave 7% AMI efficiency (without AR coating). Both silver fluoride and fluorocarbon screened paste electrodes can be produced for approximately $0.04 per watt.

A.R.H.

N83-14675*# Westinghouse Research and Development Center, Pittsburgh, Pa.

LARGE-AREA SHEET TASK ADVANCED DENDRITIC WEB GROWTH DEVELOPMENT Quarterly Report, 1 Jan. - 31 Mar. 1982

C. S. Duncan, R. G. Seidensticker, J. P. McHugh, R. H. Hopkins, D. Meier, and J. Schruben 18 Aug. 1982 28 p refs Sponsored in part by DOE Prepared for JPL

(Contract JPL-955843)

(NASA-CR-169637; DOE/JPL-955843-82/6; NAS 1.26:169637)

Avail: NTIS HC A03/MF A01 CSCL 10A

The 'discrete shield' temperature model was completed and verified. Modifications to the J419 low stress configuration were tested experimentally to evaluate effects on growth speed. A composite lid and shield configuration combining the low stress features of the J419 with the width limiting characteristics of the J98M3 was fabricated and tested in the N-furnace. Several long crystals were grown with width limited to about 3.3 cm and with melt replenishment, although the configuration is not yet optimized for steady state growth. S.L.

N83-14676*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES AND PROCESSES FOR SOLAR CELL ENCAPSULANTS
P. B. Willis and B. Baum Jul. 1982 145 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-954527; JPL Proj. 6072.1)
(NASA-CR-169636; DOE/JPL-954527-82; NAS 1.26:169636; Rept-9950-744) Avail: NTIS HC A07/MF A01 CSCL 10A

The evaluation of potentially useful low cost encapsulation materials is discussed. The goal is to identify, evaluate, test and recommend encapsulant materials and processes for the production of cost effective, long life solar cell modules. Technical investigations concerned the development of advanced cure chemistries for lamination type pottants; the continued evaluation of soil resistant surface treatment, and the results of an accelerated aging test program for the comparison of material stabilities. New compounds were evaluated for efficiency in curing both ethylene/vinyl acetate and ethylene/methyl acrylate pottants intended for vacuum bag lamination of solar cells. Two component aliphatic urethane casting syrups were evaluated for suitability as solar module pottants on the basis of optical, physical and fabrication characteristics. R.J.F.

N83-14677*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
STRESS STUDIES IN EPG Quarterly Progress Report, 9 Jul. - 30 Sep. 1982
15 Oct. 1982 17 p refs Sponsored in part by DOE
(Contract JPL-956312)
(NASA-CR-169640; DOE/JPL-956312-82/01; NAS 1.26:169640) Avail: NTIS HC A02/MF A01 CSCL 10A

A program to study stress generation mechanisms in silicon sheet growth was started. The purpose of the research is to define post-growth temperature profiles for the sheet that can minimize its stress during growth at high speeds, e.g., greater than 3 cm/min. The initial tasks described concern work in progress toward the development of computing capabilities to (1) model stress-temperature relationships in steady-state ribbon growth, and (2) provide a means to calculate realistic temperature fields in ribbon, given growth system component temperatures as boundary conditions. If it is determined that low stress configurations can be achieved, the modeling is to be tested experimentally by constructing low-stress growth systems for EFG silicon ribbon. Author

N83-14678*# Ford Aerospace and Communications Corp., Palo Alto, Calif. Antenna Engineering Dept.
FEASIBILITY STUDY OF SOLID SURFACE SUBREFLECTOR PRODUCTION TECHNIQUES Final Report
15 May 1982 25 p refs Prepared for JPL
(Contracts NAS7-100; JPL-956137)
(NASA-CR-169642; NAS 1.26:169642; WDL-TR9598) Avail: NTIS HC A02/MF A01 CSCL 10A

The principal effort was to study technical feasibility and cost aspects of the production technique of spin forming a subreflector reflective surface to a desired surface of revolution, back the surface with fiberglass to stabilize it sufficiently so that it may be machined to the target surface tolerance of .008 inches Root Mean Square (RMS) with a goal of .003 inches RMS. To verify this production technique, analyses was performed to define the production procedure. A price estimate for a 150 inch diameter subreflector for a 34 meter cassegrain antenna. During this feasibility study, numerous production processes were evaluated theoretically as production approaches for single surface, non-welded subreflectors. The first successful was the principal process of spin forming the reflective surface, backing with fiberglass and machining to a final contour. The second successful process was spin forming or bump forming a thicker reflective surface, with an integral (welded in) structure as a backing and machining the mounting pads and reflector to a final configuration. B.W.

N83-14679*# Photowatt International, Inc., Tempe, Ariz.
DEVELOPMENT OF TECHNIQUE FOR AR COATING NICKEL AND COPPER METALLIZATION OF SOLAR CELLS FPS PROJECT PRODUCT DEVELOPMENT Quarterly Technical Report, 1 Apr. - 30 Jun. 1982
William Taylor 15 Jul. 1982 20 p refs Prepared for JPL
(Contract JPL-955986)
(NASA-CR-169616; DOE/JPL-955986-3; NAS 1.26:169616; QTR-4) Avail: NTIS HC A02/MF A01 CSCL 10A

Experimental matrices were conducted to determine a suitable firing schedule for fritless tin printing ink. considerable difficulties were encountered with oxidation. Best results were obtained with a firing cycle consisting of 400 C for 20 minutes in nitrogen followed by 5 minutes in air at 500 C. Elimination of oxidizing conditions impaired the adhesion of both tin and copper fritless printing inks, although adhesion of fritless copper inks was obtained when fired in nitrogen with slight oxidation. Author

N83-14680*# Materials Research, Inc., Centerville, Utah.
ANALYSIS OF DEFECT STRUCTURE IN SILICON. CHARACTERIZATION OF SAMPLES FROM UCP INGOT 5848-13C Interim Report
R. Natesh, T. Guyer, and G. B. Stringfellow Aug. 1982 75 p refs
(Contract JPL-955676)
(NASA-CR-169617; DOE/JPL-955676-2; NAS 1.26:169617; MRI-290) Avail: NTIS HC A04/MF A01 CSCL 10A

Statistically significant quantitative structural imperfection measurements were made on samples from ubiquitous crystalline process (UCP) Ingot 5848 - 13 C. Important trends were noticed between the measured data, cell efficiency, and diffusion length. Grain boundary substructure appears to have an important effect on the conversion efficiency of solar cells from Semix material. Quantitative microscopy measurements give statistically significant information compared to other microanalytical techniques. A surface preparation technique to obtain proper contrast of structural defects suitable for QTM analysis was perfected. S.L.

N83-14681*# Underwriters Labs., Inc., New York.
DEVELOPMENT OF PHOTOVOLTAIC ARRAY AND MODULE SAFETY REQUIREMENTS Final Report
Jun. 1982 155 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955392)
(NASA-CR-169641; DOE/JPL-955392-1; NAS 1.26:169641) Avail: NTIS HC A08/MF A01 CSCL 10A

Safety requirements for photovoltaic module and panel designs and configurations likely to be used in residential, intermediate, and large-scale applications were identified and developed. The National Electrical Code and Building Codes were reviewed with respect to present provisions which may be considered to affect the design of photovoltaic modules. Limited testing, primarily in the roof fire resistance field was conducted. Additional studies and further investigations led to the development of a proposed standard for safety for flat-plate photovoltaic modules and panels. Additional work covered the initial investigation of conceptual approaches and temporary deployment, for concept verification purposes, of a differential dc ground-fault detection circuit suitable as a part of a photovoltaic array safety system. R.J.F.

N83-14682*# Solarelectronics, Inc., Bellingham, Mass.
INVESTIGATION OF THE HYDROCHLORINATION OF SiCL4 Quarterly Report, 9 Apr. - 8 Jul. 1982
Jeffrey Y. P. Mui 12 Apr. 1982 38 p refs Sponsored in part by DOE Prepared for JPL

(Contracts NAS7-100; JPL-956061)
(NASA-CR-169622; DOE/JPL-956061-4; NAS 1.26:169622; QR-4) Avail: NTIS HC A03/MF A01 CSCL 10A

Reaction kinetic measurements on the hydrochlorination of SiCl4 and metallurgical grade (m.g.) silicon metal were made at a wide range of experimental variables. The effect of pressure on the reaction rate was studied at 25 psig, 100 psig, 150 psig and 200 psig, respectively. Results of these experiments show a large pressure effect on the hydrochlorination reaction. As expected, higher pressures produce a higher equilibrium SiHC13 conversion, since the hydrochlorination reaction results in a net volume contraction as product SiHC1 is formed. However, the reaction rate, namely, the rate at which the hydrochlorination reaction reaches its equilibrium SiHC13 conversion, was found to be much faster at low pressures. Author

N83-14683*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE NASA REDOX STORAGE SYSTEM DEVELOPMENT PROJECT, 1980
Dec. 1982 73 p refs
(Contract DE-AI04-80AL-12726)
(NASA-TM-82940; E-1340; DOE/NASA/12726-18; NAS 1.15:82940) Avail: NTIS HC A04/MF A01 CSCL 10C

The technical accomplishments pertaining to the development of Redox systems and related technology are outlined in terms of the task elements: prototype systems development, application analyses, and supporting technology. Prototype systems development provides for a major procurement to develop an industrial capability to take the current NASA Lewis technology and go on to the design, development, and commercialization of iron-chromium Redox storage systems. Application analyses provides for the definition of application concepts and technology requirements, specific definition studies, and the identification of market sectors and their penetration potential. Supporting technology includes both in house and contractual efforts that encompass implementation of technology improvements in membranes, electrodes, reactant processing, and system design. The status of all elements is discussed. J.M.S.

N83-14684*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LITHIUM/SULFUR DIOXIDE CELL AND BATTERY SAFETY
Gerald Halpert and Art Anderson Nov. 1982 19 p refs
(NASA-RP-1099; NAS 1.61:1099) Avail: NTIS HC A02/MF A01 CSCL 10C

The new high-energy lithium/sulfur dioxide primary electrochemical cell, having a number of advantages, has received considerable attention as a power source in the past few years. With greater experience and improved design by the manufacturers, this system can be used in a safe manner provided the guidelines for use and safety precautions described herein are followed. In addition to a description of cell design and appropriate definitions, there is a safety precautions checklist provided to guide the user. Specific safety procedures for marking, handling, transportation, and disposal are also given, as is a suggested series of tests, to assure manufacturer conformance to requirements. Author

N83-14685*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ADVANCED CZOCHRALSKI SILICON GROWTH TECHNOLOGY FOR PHOTOVOLTAIC MODULES
Taher Daud and Akaram H. Kachare 15 Sep. 1982 40 p refs Sponsored by NASA
(Contract DE-AI01-76ET-20356)
(NASA-CR-169661; DOE/JPL-1012-70; JPL-Pub-82-35; JPL-5101-207; NAS 1.26:169661) Avail: NTIS HC A03/MF A01 CSCL 10A

Several economic analyses had indicated that large-diameter, multiple ingot growth using a single crucible with melt replenishment would be required for Cz growth to be economically viable. Based on the results of these analyses, two liquid and two solid feed melt replenishment approaches were initiated. The sequential solid feed melt replenishment approach, which demonstrated elements of technical feasibility is described in detail in this paper. Growth results of multiple ingots (10-cm-diameter, totaling 100 kg; and 15-cm-diameter, totaling 150 kg weight per crucible) are presented. Solar cells were fabricated and analyzed to evaluate the effects of structure and chemical purities as a result of multiple growth. The results indicate that, with semiconductor-grade silicon, feedstock impurity build-up does not seem to degrade cell performance. For polycrystalline cells, the average efficiencies are 15 to 25% lower than those of single crystalline cells. Concerns regarding single crystal yields, crucible quality and growth speed are indicated, and present status and future research thrusts are also discussed. Author

N83-14686*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISTRIBUTED PHOTOVOLTAIC SYSTEMS: UTILITY INTERFACE ISSUES AND THEIR PRESENT STATUS. INTERMEDIATE/THREE-PHASE SYSTEMS
R. L. Das, J. W. Klein, and T. W. Macie 15 Sep. 1982 106 p refs Sponsored by NASA and DOE Prepared for Sandia Labs., Albuquerque, N. Mex.
(NASA-CR-169664; JPL-Pub-82-63; NAS 1.26:169664) Avail: NTIS HC A06/MF A01 CSCL 10A

The interface issues between the intermediate-size Power Conditioning Subsystem (PCS) and the utility are considered. A literature review yielded facts about the status of identified issues. Author

N83-14687*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR CELL RADIATION HANDBOOK
H. Y. Tada (TRW, Inc., Cleveland), J. R. Carter, Jr. (TRW, Inc., Cleveland), B. E. Anspaugh, and R. G. Downing 1 Nov. 1982 403 p refs
(NASA-CR-169662; JPL-Pub-82-69; NAS 1.26:169662) Avail: NTIS HC A18/MF A01 CSCL 10A

The handbook to predict the degradation of solar cell electrical performance in any given space radiation environment is presented. Solar cell theory, cell manufacturing and how they are modeled mathematically are described. The interaction of energetic charged particles radiation with solar cells is discussed and the concept of 1 MeV equivalent electron fluence is introduced. The space radiation environment is described and methods of calculating equivalent fluences for the space environment are developed. A computer program was written to perform the equivalent fluence calculations and a FORTRAN listing of the program is included. Data detailing the degradation of solar cell electrical parameters as a function of 1 MeV electron fluence are presented. E.A.K.

N83-14688*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE EFFECT OF YAW ON HORIZONTAL AXIS WIND TURBINE LOADING AND PERFORMANCE
John C. Glasgow, R. D. Corrigan, and Dean R. Miller 1980 22 p refs Presented at the fifth Biennial Wind Energy Conf. and Workshop, Washington, D.C., 5-7 Oct. 1980; sponsored by DOE
(Contract DE-AI07-76ET-20320)
(NASA-TM-82778; E-1108; DOE/NASA/20320-35; NAS 1.15:82778) Avail: NTIS HC A02/MF A01 CSCL 10A

The Mod-0 100 kW experimental wind turbine was tested to determine the effects of yaw on rotor power, blade loads and teeter response. The wind turbine was operated for extended preiods at yaw angles up to 49 deg to define average or mean response to yaw. It was determined that the effect of yaw on rotor power can be approximated by the cube of the velocity normal to the rotor disc as long as the yaw angle is less than 30 deg. Blade bending loads were relatively unaffected by yaw, but teeter angle increased with wind speed as the magnitude of the yaw angle exceeded 30 deg indicating a potential for teeter stop impacts at large yaw angles. No other adverse effects due to yaw were noted during the tests. S.L.

N83-14689*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASURED PERFORMANCE OF A TIP-CONTROLLED, TEETERED ROTOR WITH AN NACA 64 SUB 3-618 TIP AIRFOIL
Robert D. Corrigan, John C. Glasgow, and Paul J. Sirocky 1982 16 p refs Presented at the Wind and Solar Energy Conf., Kansas City, Mo., 5-7 Apr. 1982
(Contract DE-AI01-76ET-20320)
(NASA-TM-82870; DOE/NASA/20320-40; E-1240; NAS 1.15:82870) Avail: NTIS HC A02/MF A01 CSCL 10A

Tests were conducted on the Mod-O 100 kW Wind Turbine to determine the performance of a tip-controlled rotor having an NACA 64 sub-618 airfoil over the moveable outboard 30% of the blade, while operating at nominal rotor speeds of 21 and 31 rpm. Tests were conducted at two rotor speeds to assess the performance improvement which could be realized with 2-speed operation. Test data are compared with analytical predictions and concluding remarks are presented. The results indicate a clear performance improvement for the 2-speed operation. Author

N83-14690*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DOE/NASA LEWIS LARGE WIND TURBINE PROGRAM
R. L. Thomas 1982 15 p refs Presented at the Natl. Rural Elec. Coop. Assoc. and DOE Rural Elec. Wind Energy Workshop, Boulder, Colo., 1-3 Jun. 1982
(Contract DE-AI01-76ET-20320)
(NASA-TM-82991; DOE/NASA/20320-42; E-1423; NAS 1.15:82991) Avail: NTIS HC A02/MF A01 CSCL 10A

An overview of the large wind turbine activities managed by NASA is given. These activities include resuls from the first and second generation field machines (Mod-0A, -1, and -2), the status of the Department of Interior WTS-4 machine for which NASA is responsible for technical management, and the design phase of the third generation wind turbines (Mod-5). R.J.F.

N83-14691*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ASSESSMENT OF ALTERNATIVE POWER SOURCES FOR MOBILE MINING MACHINERY
James E. Cairelli, William A. Tomazic, David G. Evans, and John L. Klann Dec. 1981 109 p refs
(NASA-TM-82695; E-978; NAS 1.15:82695) Avail: NTIS HC A06/MF A01 CSCL 08I

Alternative mobile power sources for mining applications were assessed. A wide variety of heat engines and energy systems was examined as potential alternatives to presently used power systems. The present mobile power systems are electrical trailing cable, electrical battery, and diesel - with diesel being largely limited in the United States to noncoal mines. Each candidate power source was evaluated for the following requirements: (1) ability to achieve the duty cycle; (2) ability to meet Government regulations; (3) availability (production readiness); (4) market availability; and (5) packaging capability. Screening reduced the list of candidates to the following power sources: diesel, stirling, gas turbine, rankine (steam), advanced electric (batteries), mechanical energy storage (flywheel), and use of hydrogen evolved from metal hydrides. This list of candidates is divided into two classes of alternative power sources for mining applications, heat engines and energy storage systems. E.A.K.

N83-14692* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HEAT TRANSPARENT HIGH INTENSITY HIGH EFFICIENCY SOLAR CELL Patent
John C. Evans, Jr., inventor (to NASA) Issued 15 May 1981 7 p Filed 15 May 1981 Supersedes N81-27598 (19 - 18, p 2506)
(NASA-Case-LEW-12892-1; US-Patent-4,360,701; US-Patent-Appl-SN-264380; US-Patent-Class-136-259; US-Patent-Class-136-255; US-Patent-Class-136-256) Avail: US Patent and Trademark Office CSCL 10A

An improved solar cell design is described. A surface of each solar cell has a plurality of grooves. Each groove has a vertical face and a slanted face that is covered by a reflecting metal. Light rays are reflected from the slanted face through the vertical face where they traverse a photovoltaic junction. As the light rays travel to the slanted face of an adjacent groove, they again traverse the junction. The underside of the reflecting coating directs the light rays toward the opposite surface of solar cell as they traverse the junction again. When the light rays travel through the solar cell and reach the saw toothed grooves on the under side, the process of reflection and repeatedly traversing the junction again takes place. The light rays ultimately emerge from the solar cell. These solar cells are particularly useful at very high levels of insolation because the infrared or heat radiation passes through the cells without being appreciably absorbed to heat the cell.
Official Gazette of the U.S. Patent and Trademark Office

N83-14693* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
GAS-TO-HYDRAULIC POWER CONVERTER Patent
Charles W. Galloway, inventor (to NASA) Issued 27 Feb. 1981 7 p Filed 27 Feb. 1981 Supersedes N81-24445 (19 - 15, p 2063)
(NASA-Case-MSC-18794-1; US-Patent-4,360,325; US-Patent-Appl-SN-238785; US-Patent-Class-417-399; US-Patent-Class-74-110) Avail: US Patent and Trademark Office CSCL 10B

A gas piston driven hydraulic piston pump is described in which the gas cycle is of high efficiency by injecting the gas in slugs at the beginning of each power stroke. The hydraulic piston is disposed to operate inside the as piston, and the two pistons, both slidably but nonrotatably mounted, are coupled together with a rotating but non-sliding motion transfer ring extending into antifriction grooves in the sidewalls of the two pistons. To make the hydraulic piston move at a constant speed during constant hydraulic horsepower demand and thus exert a constant pressure on the hydraulic fluid, these grooves are machined with variable pitches and one is the opposite of the other, i.e., the gas piston groove increases in pitch during its power stroke while the hydraulic piston groove decreases. Any number of piston assembly sets may be used to obtain desired hydraulic horsepower.
Official Gazette of the U.S. Patent and Trademark Office

N83-14694# European Space Agency, Paris (France).
PHOTOVOLTAIC GENERATORS IN SPACE
W. R. Burke, comp. Jun. 1982 331 p refs Partly in ENGLISH and FRENCH Proc. of 3rd European Symp. Bath, England, 4-6 May 1982; sponsored in cooperation with UK Dept. of Industry and RAE
(ESA-SP-173; ISSN-0379-6566) Avail: NTIS HC A15/MF A01

Solar array design and testing were discussed. Radiation damage, blankets, solar cells, and the status of NASA and ESA spacecraft solar energy development programs were considered. For individual titles, see N83-14695 through N83-14738.

N83-14695*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE SWING TO CONCENTRATOR ARRAYS
J. L. Miller *In* ESA Photovoltaic Generators in Space Jun. 1982 p xix-xxiv refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01 CSCL 10A

Objectives and progress in both low concentration ratio (6 to 10) and high concentration ratio (> 100) array developments are summarized. Problems encountered include: thermal control, maldistribution of concentrated sunlight, current busing, and optical surface degradation. The potential advantages over planar arrays are an order of magnitude reduction in per unit cost of power plus increased immunity to radiation damage. Author (ESA)

N83-14696# AEG-Telefunken, Wedel (West Germany).
LOW EARTH ORBIT BLANKET TECHNOLOGIES FOR THE POWER RANGE OF 15-60 kW
H. Bebermeier *In* ESA Photovoltaic Generators in Space Jun. 1982 p 3-7 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The development of a 3.2 x 50 m foldable solar array is discussed. The blanket skin has a homogeneous rear side wiring of copper. A very thin foil is bonded onto the rear side of the glass fiber reinforced Kapton, giving extremely high in-plane and out-of-plane stiffness of the array compared to present technology. Metallic foil is also used to reinforce the hinge cusp and foldline cusp. The bending stiffness over the width of the array is optimized by the height and shape of the cusp and its reinforcement. Silicon or embossed Kapton damping cross elements (padding) placed in the solar cell corner gap, come down onto the center of the adjacent cell during retraction. A 5 x 5 cm silicon cell with back surface is used. Author (ESA)

N83-14697# Royal Netherlands Aircraft Factories Fokker, Amsterdam.
ADVANCED RIGID ARRAY
D. Mawira *In* ESA Photovoltaic Generators in Space Jun. 1982 p 9-14 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The development of an advanced rigid solar array designed to provide powers from 2 to 6 kW for medium class communications satellites is described. For satellites with single axis Sun tracking solar arrays, a rigid structure is suitable. A 50/50 percentage weight proportion, using back surface reflector/back surface field 100 microns solar cells, is possible. No interference problems are expected for the electrical system design. Author (ESA)

N83-14698# AEG-Telefunken, Wedel (West Germany). Neue Technologien.
MODULE TECHNIQUE OF 5 x 5 cm(2) SOLAR CELLS
J. Koch *In* ESA Photovoltaic Generators in Space Jun. 1982 p 17-21 refs Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Investigations of cover glass bonding, contact welding, interconnection design and solar cell laydown to substrates are summarized. The module technique for 5 x 5 cm cells is characterized by 100 micron thick space qualified cover glasses (microsheet and fused silica) and interconnectors with stress reliefs in an out of plane and an inplane configuration. Thermal cycle tests prove the applicability of 5 x 5 cm cell module techniques on solar arrays. Author (ESA)

N83-14699*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LARGE AREA LOW-COST SPACE SOLAR CELL DEVELOPMENT
C. R. Barona and J. L. Cioni (NASA. Johnson Space Center) *In* ESA Photovoltaic Generators in Space Jun. 1982 p 23-26 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01 CSCL 10A

A development program to produce 5.9 x 5.9 cm space quality silicon solar cells with a cost goal of 30 $/W is described. Cell types investigated include wraparound dielectric, mechanical wraparound and conventional contact configurations with combinations of 2 or 10 ohm/cm resistivity, back surface reflectors and/or fields, and diffused or ion implanted junctions. A single step process to cut cell and cover glass simultaneously is being developed. Results for cell and array tests are given. Large solar arrays that might use cells of this type are discussed.
Author (ESA)

N83-14700# ETSI Telecomunicacion, Barcelona (Spain).
NONLINEAR ALGORITHMS APPLICATION TO IRRADIATED SOLAR CELL PARAMETERS EVALUATION
J. Cabestany and L. Castaner *In* ESA Photovoltaic Generators in Space Jun. 1982 p 27-33 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

A method which calculates the parameters of solar cell equivalent circuits is presented. The method is based on the definition of an object function of the difference between the experimental I(V) curve and the model. The object function is found to be nonlinear, so algorithms have to be used to find a solution that optimizes this function. Least mean square and minimax both give good results. A method to find an initial solution, critical in the time calculations of the routine, is also described. The parameters of proton irradiated solar cells were calculated.
Author (ESA)

N83-14701# Katholieke Universiteit te Leuven (Belgium). Lab. ESAT.
LIFT OFF: A VERY FINE FRONT METALLIZATION GEOMETRY TECHNIQUE FOR HIGH EFFICIENCY SOLAR CELLS
J. Nijs, F. DHoore, R. Mertens, and R. VanOverstraeten *In* ESA Photovoltaic Generators in Space Jun. 1982 p 37-42 refs Sponsored by Belgium National Research and Development Program of Energy (For primary document see N83-14694 05-44)
(Contract EEC-153-77-9ESB)
Avail: NTIS HC A15/MF A01

A lift off technique for TiPdAg metallization is described. A photoresist pattern is used before evaporation of the metal. After the metal is evaporated, the photoresist is removed, lifting off the metal on top of it. Where the photoresist was already removed before metallization with developing, the metal remains on the wafer. There must be a discontinuity in the metal due to the photoresist pattern, so that the dissolvant can reach the resist itself or the steps in the photoresist pattern may only be covered with a very thin layer of metal when the technique is used in an ultrasonic medium. Fingers of 10 microns width and 3 microns thickness are obtained, resulting in an optimized trade-off between metal coverage and series resistance. Silicon solar cells with AM1 efficiencies $>$ 17% are obtained. Author (ESA)

N83-14702# Spectrolab, Inc., Sylmar, Calif.
THIN CELL DEVELOPMENT AND TESTING
Jay Fodor and Nancy Neal *In* ESA Photovoltaic Generators in Space Jun. 1982 p 43-50 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Over 200 silicon cells, 62 microns thick, with average AMO efficiencies of 13.5% were used in the fabrication of 10 lightweight modules featuring flexible substrates, welded interconnects, and thin coverslides ($>$ 100 microns). The ability of these five cells in series by three cells in parallel modules to survive the space environment was proven by subjecting modules to acoustic and thermal cycle testing typical of planned geosynchronous missions. Author (ESA)

N83-14703# AEG-Telefunken, Heilbronn (West Germany).
A FAMILY OF THIN HIGH EFFICIENCY SILICON SOLAR CELLS
K.-D. Rasch, K. Roy, K.-H. Tentscher, and D. Gringel *In* ESA Photovoltaic Generators in Space Jun. 1982 p 51-56 refs Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Ultrathin (50 micron) and thin (100 and 150 micron) silicon solar cells were produced. The matrix contains cells with back surface reflector (BSR) and back surface field (BSF). The beginning of life (BOL) electrical output and the cell performance after electron irradiation up to 1 MeV and post photon irradiation testing as a function of thickness and base material (1 ohm-cm float zone and 10 ohm-cm crucible grown (CG) boron doped silicon) are presented. The ultrathin BSFR cell is the only cell that shows the advantage of BSF beyond 1MeV. In respect to cost and yield, non-BSF cells with an optimized BSR in the range of 100 to 150 microns are attractive for high fluence level missions. Besides the thermal advantage, the BSR in conjunction with diffused BSF shows benefits after electron radiation due to the photovoltaic effects of BSR. The FZ cells show the lowest EOL power output as a result of photon induced degradation. Nevertheless, these cells can be as attractive as a high EOL open-circuit voltage device, if the problem of photon degradation can be solved.
Author (ESA)

N83-14704# Thorn EMI, Hayes (England). Central Research Labs.
ELECTROPHORETED CdS/Cu2S SOLAR CELLS FOR SPACE APPLICATIONS
E. W. Williams, D. J. Gibbons, T. J. Cumberbatch, I. D. McInally, and M. ClayBourn *In* ESA Photovoltaic Generators in Space Jun. 1982 p 57-61 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Both CdS and Cu2S were deposited by a process which uses ammonium sulphide instead of hydrogen sulphide. Cracking is a problem on films with a thickness above 1.5 microns. In space grain size problems should be eliminated as calculations show that particle sizes > 0.5 microns can be used in the colloids compared to 0.02 microns for terrestial colloids. Another problem is oxygen inclusion at the anode due to the lack of buoyancy of the bubbles formed in the water/methanol mixtures. However, high methanol contents reduce bubble concentrations. These photovoltaic junctions could be easily prepared in a long life solar breeder spacecraft. Tests of annealing with a pulsed dye laser indicate that photovoltages of 400mV can be produced from copper dipped CdS films. Author (ESA)

N83-14705*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ON THE CAUSE OF THE FLAT-SPOT PHENOMENON OBSERVED IN SILICON SOLAR CELLS AT LOW TEMPERATURES AND LOW INTENSITIES
V. G. Weizer, J. D. Broder, H. W. Brandhorst, and A. F. Forestieri *In* ESA Photovoltaic Generators in Space Jun. 1982 p 65-70 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01 CSCL 10A

A model that explains the flat-spot power loss phenomenon is presented. Evidence suggests that the effect is due to localized metallurgical interactions between the silicon substrate and the contact metallization. These reactions are shown to result in localized regions in which the P-N junction is destroyed and replaced with a metal semiconductor-like interface. The effects of thermal treatment, crystallographic orientation, junction depth, and metallization are shown along with a method of preventing the effect through the suppression of vacancy formation at the free surface of the contact metallization. Data indicating the effectiveness of a TiN diffusion barrier in preventing the effect are also given. Author (ESA)

N83-14706# AEG-Telefunken, Heilbronn (West Germany). Electronic Components Div.
ASPECTS OF END OF LIFE DESIGN FOR SOLAR CELLS
R. Schilling, K.-D. Rasch, and K. Roy *In* ESA Photovoltaic Generators in Space Jun. 1982 p 71-75 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The power performances before and after electron irradiation of solar cells with different short wavelength responses and of solar cells with material or process induced low initial power output are represented. From a 10 ohm-cm crucible grown boron doped crystal, high efficiency solar cells with different shallow junctions and with different reflection minima were produced. Standard high efficiency solar cells were obtained from the same crystal with simulated process failure and from a second crystal with low carrier lifetime. Short circuit current and maximum power were measured after fabrication and after 1 MeV electron irradiation of fluences of 2 times 10 to the 14th and 1 times 10 to the 15th power/sqcm. High initial power optimized solar cells change to lower values after electron irradiation in contrast to the cells with lower initial power but high short wavelength response. It is demonstrated that after electron irradiation the power decrease of cells with material or process induced low initial power is smaller compared with reference cells. Author (ESA)

N83-14707# Technische Universitaet, Brunswick (West Germany). Inst. fuer Raumflugtechnik und Reaktortechnik.
OPTIMIZATION OF SILICON SOLAR CELLS FOR SOLAR GENERATORS WITH CONCENTRATION
W.-D. Ebeling and D. Rex *In* ESA Photovoltaic Generators in Space Jun. 1982 p 77-85 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Solar cell optimization by changing the contact grid pattern and the thickness of the n-layer in order to reduce the electrical series resistance, and by changing the thickness of the antireflective coating in order to adjust it to the inclined irradiation are discussed. A mathematical model of silicon solar cells by which the optimal solar cell type can be designed individually for each concentration system is presented. Such optimized solar cells can produce 18% more power than conventional cells in the concentrating system SARA. Author (ESA)

N83-14708*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF PROCESSING AND DOPANT ON RADIATION DAMAGE REMOVAL IN SILICON SOLAR CELLS
I. Weinberg, H. W. Brandhorst, C. K. Swartz, and S. Mehta *In* ESA Photovoltaic Generators in Space Jun. 1982 p 89-93 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Gallium and boron doped silicon solar cells, processed by ion implantation followed by either laser or furnace anneal were irradiated by 1 MeV electrons and their postirradiation recovery by thermal annealing was determined. During the postirradiation anneal, gallium doped cells prepared by both processes recovered more rapidly and exhibited none of the severe reverse annealing observed for similarly processed 2 ohm-cm boron doped cells. Ion implanted furnace annealed 0.1 ohm-cm boron doped cells exhibited the lowest post-irradiation annealing temperatures after irradiation. The drastically lowered recovery temperature is attributed to the reduced oxygen and carbon content of the 0.1 ohm-cm cells. Analysis based on defect properties and annealing kinetics indicates that further reduction in annealing temperature is attainable with further reduction in the silicon's carbon and/or divacancy content after irradiation. Author (ESA)

N83-14709# Royal Aircraft Establishment, Farnborough (England). Space and New Concepts Dept.
OMNIDIRECTIONAL PROTON RADIATION OF THIN AND THICK SOLAR CELLS
M. W. Walkden *In* ESA Photovoltaic Generators in Space Jun. 1982 p 95-102 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Proton damage ratios, relating the damage caused by 1 MeV electrons to that caused by protons of various energies, were found for hemispherical isotropic proton conditions. The proton fluences were incident on either the front or rear of the cell. Six types of cell ranging in thickness from 50 to 250 microns were used. The ratios are much higher than those derived in earlier studies where normal incidence protons were employed, although the differences are offset by the cell cover glass or rear shield. Results are compared with proton maps AP6 and AP8.
Author (ESA)

N83-14710# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
THE REDUCTION OF RADIATION DAMAGE IN SPACE SOLAR CELLS. A STUDY OF RADIATION DEFECTS IN SILICON (+)
D. Bielle-Daspet, J. Bourgoin (Paris Univ. VII), J. Bernard (ONERA, Toulouse), L. Castaner-Munoz (ETSI Telecomunicacion), L. Pratt (ESTEC, Noordwijk, Netherlands), and R. L. Crabb *In* ESA Photovoltaic Generators in Space Jun. 1982 p 103-108 refs (For primary document see N83-14694 05-44)
(Contract ESTEC-4510/80/NL-JS(SC))
Avail: NTIS HC A15/MF A01

Research data on space environmental flux and simulation conditions; electron and photon induced defects; measurement techniques for correlated study of the microscopic macroscopic and global (electrical) degradation of the solar cell; and numerical

models for space cell and degradation prediction were reviewed. The survey indicates that space factors must include possible contributions of solar flare protons, photon effects and thermal annealing due to the insolation and temperature cycles of the solar generators. An adapted set of measurement techniques must be used in order to obtain comprehensive characterization of defect and solar-cell behavior. In numerical models of solar cell electrical behavior and degradation, cell structure as well as defect and carrier properties must be introduced. In space, P-type silicon should behave better than N-type; lithium in N-type gives improvement only in particular cases, and photon degradation seems to be related to boron doping when carbon and oxygen content are simultaneously low. Author (ESA)

N83-14711# Southampton Univ. (England). Faculty of Mathematical Sciences.
ELECTRON AND PHOTON DEGRADATION OF BORON DOPED FZ SILICON SOLAR CELLS
T. Markvart, T. J. Cumberbatch (Thorn-EMI), M. W. Walkden (RAE, Farnborough, Engl.), and A. A. Dollery *In* ESA Photovoltaic Generators in Space Jun. 1982 p 109-114 refs Sponsored by SRC (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The short circuit current of cells damaged by electron irradiation and post-electron illumination was analyzed. It is shown that the electron damage coefficient of the cells is inversely proportional to the base resistivity, in the range 0.3 to 115 ohm-cm. Photon degradation (characterized by the ratio r identical with K ph/Kel = Sigma ph/Sigma el, where K ph and Kel are functions of the base resistivity, and describe the resistivity dependence of photon and electron degradation) displays a more complicated resistivity dependence. This is explained in terms of illumination-induced defect reaction whose rate depends on the charge states of the reactants. Author (ESA)

N83-14712# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
RETROSPECT OF SOLAR CELL DEVELOPMENT IN WEST GERMANY
Helmut R. Loesch *In* ESA Photovoltaic Generators in Space Jun. 1982 p 117-120 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Solar cell development in West Germany from 1963 onwards is described. Author (ESA)

N83-14713*# National Aeronautics and Space Administration, Washington, D. C.
NASA SPACE PHOTOVOLTAIC RESEARCH AND TECHNOLOGY PROGRAMS
J. P. Mullin and D. J. Flood *In* ESA Photovoltaic Generators in Space Jun. 1982 p 121-126 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The NASA programs for increasing conversion efficiency, reduced mass and cost, and extending operating life of photovoltaic converters and arrays and for evaluating advanced solar array concepts are outlined. Research into radiation resistance and annealing, development of thin blankets, high-power low-cost arrays, and lightweight structures for near-Earth and planetary applications are discussed. Author (ESA)

N83-14714# Societe Nationale Industrielle Aerospatiale, Cannes (France).
TV-SAT SOLAR ARRAY
G. Urbain, C. Rinn, and J. L. Bastard *In* ESA Photovoltaic Generators in Space Jun. 1982 p 129-133 ref (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The electrical and mechanical performance of the TV-SAT direct television broadcasting satellite is described. The 4.5 kW end of life 7.5yr array contains 43,200 back surface reflector solar cells. The first, 3.1 kW, array consists of two identical wings, providing power during transfer and geostationary orbit. Each wing is made up of four carbon fiber panels. The outboard panel of each wing is deployed at 90 deg in transfer orbit, during which the satellite is three axis stabilized. Author (ESA)

N83-14715# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
FURTHER DEVELOPMENTS OF THE ECS SOLAR ARRAY
A. Vieleers and F. Zijdemans *In* ESA Photovoltaic Generators in Space Jun. 1982 p 135-140 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The ECS/MARECS communications satellite modular solar array is described. The baseline array configuration provides 1000 W at 50 V for a minimum lifetime of 1 yr for ECS. The array consists of two wing assemblies, each having three identical panels hinged together and connected to the spacecraft via a yoke. The lightweight panel substrates are of the rigid sandwich concept; 2240 solar cells are bonded onto each of the rectangular panels. The electrical baseline design configurations matches requirements of a regulated bus. No special battery charge sections are allocated. The power generating element is a 10 ohm-cm shallow diffused 20.95 x 40.35 mm high efficiency solar cell of 180 micron nominal thickness. Power-weight ratio is 26W/kg. Communication and scientific satellite applications are described. Author (ESA)

N83-14716# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Space Operations Center.
PRELIMINARY RESULTS OF HELIOS SOLAR GENERATOR INFLIGHT PERFORMANCE EVALUATION
J. Kehr and H. Porsche *In* ESA Photovoltaic Generators in Space Jun. 1982 p 143-147 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

A technique which assesses the Helios 1 solar generator degradation by calculating equivalent flux from data measured in flight is presented. The degradation is normalized to the 0.985 AU regulator output power value of 214 W. The measured aphelion points summarize the degradation of one orbit. Nonmeasured points are linearly interpolated. Through 14 orbits, the solar generator degraded to 37.5% of its original performance. In order to separate solar cell radiation introduced degradation of the substrate from other effects, the particle intensities as measured by Helios experiments are converted to 1 MeV equivalent fluxes using damage coefficients. The temperature increase of the solar panels at the aphelion points can be related to the loss of light intensity arriving at the substrate because the absorbed intensity is approximately proportional to temperature according to Kirchhoff's law. Author (ESA)

N83-14717# European Space Research and Technology Center, Noordwijk (Netherlands).
PRIMARY CALIBRATION OF HIGH EFFICIENCY SOLAR CELLS. A COMPARISON OF 1980 DATA FROM CNES, NASA (LEWIS), JPL AND RAE
R. L. Crabb *In* ESA Photovoltaic Generators in Space Jun. 1982 p 149-155 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Calibration results are presented for 10 high efficiency n/p, 1 ohm-cm, 2x4cmx250 microns silicon solar cells embodying TiPdAg contacts, TiOx antireflection coatings and 150 microns thick cerium doped microsheet coverslides. Three cells were calibrated by NASA on a high altitude aircraft, two cells by CNES balloon, two cells by JPL balloon and four cells by RAE at sea level. All data points fell within a band of + or - 1% spread in short circuit current. Author (ESA)

N83-14718# Societe Europeenne de Propulsion, Vernon (France).
DEVELOPMENT AND TESTING OF A SPACECRAFT SURFACE POTENTIAL MONITOR

D. Valentan, L. Levy (ONERA, Toulouse), D. Sarrail (ONERA, Toulouse), and J. C. Larue (ESTEC, Noordwijk, Netherlands) *In* ESA Photovoltaic Generators in Space Jun. 1982 p 157-160 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

A surface potential monitor was developed in order to measure the electrostatic fields in solar cell covers. The measurement correlates electrostatic discharges occuring during geomagnetic substorm events and spacecraft disturbance. Monitor output can be used to drive an active spacecraft charging control system. An electromagnet induces vibration of a flat spring holding the sensing area. The spring oscillates at its fundamental frequency. Spring and sensing area mounted on an insulator. The resulting signal feeds a charge amplifier through a coaxial cable. A high impedance ac voltmeter can also be used. The monitor is designed to withstand geostationary environment for 7 yr. The test program includes environmental acceptance tests, functional acceptance tests under vacuum then environmental tests at qualification level, and geomagnetic substorm simulation tests. Author (ESA)

N83-14719# European Space Agency, Paris (France).
ANNOUNCEMENT OF AN OPPORTUNITY FOR SPACE CALIBRATION OF SOLAR CELLS
E. G. Suppa *In its* Photovoltaic Generators in Space Jun. 1982 p 161-163 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The ESA solar cell calibration facility (SCCE) is described. The SCCE will operate regularly on shuttle pallet satellites. Specimen reference number short circuit current, open circuit voltage, and the temperature of experiment electronics are recorded for up to 32 cells. Overall measurement accuracy is better than + or - 1%. Author (ESA)

N83-14720# European Space Research and Technology Center, Noordwijk (Netherlands).
LARGE INFRARED TEST RIG FOR VACUUM TEMPERATURE CYCLING TESTS IN THE ESTEC DTC
P. Bonnot and P. W. Brinkmann *In* ESA Photovoltaic Generators in Space Jun. 1982 p 165-172 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

A rig for testing six INTELSAT 5 solar panels simultaneously was developed. It has three vertical rectangular LN2 shroud systems, which form two adjacent compartments, each 70 cm wide. Three solar panels can be suspended on rails in each compartment. The panels are almost completely enclosed by the shrouds, so that rapid transients can be achieved during temperature cycling. The solar panels are heated by an array of IR lamps in each compartment. The intensity distribution in the plane of the solar panels meets the required uniformity of + or - 10%. Mechanical interfaces are designed to allow easy adaptation to other programs. Author (ESA)

N83-14721# Physikalisch-Technische Studien G.m.b.H., Freiburg (West Germany).
LOSS CURRENTS OF SOLAR CELLS UNDER LOW EARTH ORBIT (LEO) CONDITIONS
G. Stasek *In* ESA Photovoltaic Generators in Space Jun. 1982 p 173-177 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Loss currents through plasma for different solar cell samples were measured as a function of the potential difference, distance and angle against the plasma stream, in a plasma chamber. Loss currents of 2 micro A at 200 V for a solar panel, and a lower limit for typical discharge voltages of about 200 to 300 V for solar cells are reported. Dependencies of these quantities and test results show that current and discharge voltage are governed principally by the available charged particle densities, especially electrons, and the active sample surface. The area of these surfaces determines the current in the ohmic region whereas their geometry (edges, tips) governs the discharge voltage. In the discharge region secondary electron production increases the current. Author (ESA)

N83-14722*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NASA SOLAR ARRAY FLIGHT EXPERIMENT Progress Report
Gary Turner (LMSC, Sunnyvale, Calif.) and Henry Hill *In* ESA Photovoltaic Generators in Space Jun. 1982 p 179-184 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The NASA large flexible solar array space shuttle flight experiment is described. The 32 x 4 m wing is deployed from the shuttle bay, and experiments in electrical output, multiple deployment, and structural dynamics are planned. Both 2 x 4 cm and 5.9 x 5.9 cm cell assemblies on the array blanket are evaluated. Safety/hazards provisions are described, including emergency jettison provisions. Ground testing and hardware fabrication are summarized. Author (ESA)

N83-14723# AEG-Telefunken, Wedel (West Germany).
ANALYTICAL PREDICTION OF THE DYNAMIC IN-ORBIT BEHAVIOR OF LARGE FLEXIBLE SOLAR ARRAYS
G. Behrens *In* ESA Photovoltaic Generators in Space Jun. 1982 p 187-192 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The natural motions in terms of eigenfrequencies and modes of large flexible solar arrays were determined by the finite element method (FEM). The accuracy of the FE-model was verified and improved by static and dynamic analyses. Good agreement with flight test data was established. Author (ESA)

N83-14724# European Space Agency, Noordwikj (Netherlands).
SPACE TELESCOPE: SOLAR PANEL ASSEMBLY THERMAL TEST ANALYSIS
E. K. Jaekel, G. I. M. Beere, and B. G. M. Aalders *In its* Photovoltaic Generators in Space Jun. 1982 p 193-200 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The Space Telescope solar panel assembly (ST-SPA) was tested in a thermal vacuum, for formal qualification and design verification of the SPA including the shunt diodes. The ST-SPA was instrumented with 60 thermocouples and 2 thermistors. In parallel to the thermal sensor readings, thermograms with an infrared camera were taken. Thermograms are reproduced, and updates of the thermal mathematical models are given. The use of a calibrated solar flux allowed an update of the thermo-optical properties for the SPA. Optical properties are: alpha S = 0.53, Sigma H = 0.76 for the rear side; and alpha S = 0.86, Sigma H = 0.78 (unloaded) for the front. Solar cell and shunt diode temperature for flight environments are included. Author (ESA)

N83-14725# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
EXTENDIBLE AND RETRACTABLE MASTS FOR SOLAR ARRAY DEVELOPMENTS
Andre M. V. Vieleers and Peter R. Preiswerk (Astro Research Corp.) *In* ESA Photovoltaic Generators in Space Jun. 1982 p 201-207 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The Astromast instrument boom, and its applications in European and American space programs (e.g., L-Sat, Voyager) are described. In the continuous version the longitudinal beams (longerons) are elastically coiled when in their stowed configuration. In the articulated version the longerons are segmented and hinged, and are folded when in stowed configuration. For fully automated array deployment, the Astromast provides actuation and drive for articulations of the stowage boxes from their stowed position to the array deployment position, actuation and drive for release and reapplication of blanket preload pressure, and deployment and retraction of the solar array wing. Author (ESA)

N83-14726# Pilkington Bros. Ltd., Ormskirk (England).
CMX-50: A NEW ULTRA THIN SOLAR CELL COVER FOR LIGHTWEIGHT ARRAYS

H. Taylor, A. F. Simpson, and A. A. Dollery (RAE, Farnborough, England) *In* ESA Photovoltaic Generators in Space Jun. 1982 p 211-214 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Developments which extend the available thickness range of cerium glass solar cell covers down to 0.050 mm are described. A continuous draw process offers a high volume, low cost solar cell cover material to integrate with thin silicon solar cells for the assembly of large area lightweight solar arrays. The cell covers are manufactured from an improved glass composition incorporating cerium dioxide. This glass (CMX) maintains UV cut-off and transmission properties to match the spectral response characteristics of current silicon solar cell types, provides the necessary UV rejection and ionizing particle radiation resistance, and has a high emittance value. Author (ESA)

N83-14727# Departement d'Etudes et de Recherches en Technologie Spatiale, Toulouse (France). Dept. Automatique.
ANALYTIC TOOLS FOR THE ELECTRICAL DESIGN OF SOLAR GENERATORS [OUTILS ANALYTIQUES POUR LA CONCEPTION ELECTRIQUE DE GENERATEURS SOLAIRES]
J. P. Chretien, M. Romero, and E. Dutrieu (CNES, Toulouse) *In* ESA Photovoltaic Generators in Space Jun. 1982 p 215-221 refs In FRENCH (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

A probability method which can represent a given population of solar cells, or the generator which can be constructed from them is presented. Generator operation is described by a function linked to the probability that its point of operation coincides with a point on the plane (IV) where I = current, V = voltage. The statistical significance of the function is calculated, and based on this value, the function is evaluted in terms of the initial cell population. Application to a 60 cell population is discussed. Author (ESA)

N83-14728# Optical Coating Lab., Inc., Santa Rosa, Calif. Technical Products Div.
TEXTURED SOLAR CELL COVERS FOR LIGHT WEIGHT AND HIGH PERFORMANCE
R. P. Westney, J. S. Bessey, and I. M. Sachs *In* ESA Photovoltaic Generators in Space Jun. 1982 p 223-228 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Testing of frosted, fused silica solar cell covers is described, and the advantages of this technique are outlined. Environments studied were: 1MeV electrons, to provide a baseline for cell/cover performance; and low energy, 40 KeV protons. Electrical performance, absorptance, emissivity and mechanical strength were studied. Performance is comparable to that of polished configurations, and costs are greatly reduced. The chemical etching process used to produce the textured appearance creates surfaces relatively free from stresses and imperfections, resulting in improved mechanical strength and fewer handling losses. Very thin covers can be produced. Author (ESA)

N83-14729# TRW Space Technology Labs., Redondo Beach, Calif.
ULTRALIGHTWEIGHT SOLAR ARRAY TECHNOLOGY
Paul Goldsmith and Richard Kurland *In* ESA Photovoltaic Generators in Space Jun. 1982 p 231-240 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Flat fold array technology is described, and performance for a range of missions and power levels is predicted. The array employs large area flat panel flexible substrates. The solar cells are adhesively bonded to a thin Kapton substrate to form individual panel assemblies. Any number of these panel assemblies may be joined together to make a blanket assembly. A container assembly protects each blanket assembly when stowed, and a tension guide wire assembly controls the flexible blanket shape when fully extended. Blanket extension and retraction are achieved through a motor powered lightweight trilongeron coilable lattice mast assembly. Ground and zero gravity flight tests on prototype array assemblies are successful. Author (ESA)

N83-14730# AEG-Telefunken, Wedel (West Germany).
THE DESIGN OF THE L-SAT SOLAR ARRAY
L. Gerlach, G. W. Marks (Spar Aerospace Ltd., Toronto), E. Quittner (Spar Aerospace Ltd., Toronto), J. Renshall (Spar Aerospace, Ltd., Toronto), and R. Swanenburg (Royal Netherlands Aircraft Factories Fokker, Amsterdam) *In* ESA Photovoltaic Generators in Space Jun. 1982 p 241-255 ref (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The concept, requirements, mission phases, design, analyses, and testing of a large, modular, deployable, flexible/foldable blanket, Sun tracking solar array are described. The same design is capable of providing 1.9 kW to 6.5 kW end-of-10 yr geosynchronous equinox power per spacecraft by simple modular changes, with further growth to 7.8 kW by means of structral modifications. The array undergoes partial deployment after insertion into the transfer orbit to develop 3 kW minimum and is fully deployed after apogee engine firing. Author (ESA)

N83-14731# AEG-Telefunken, Wedel (West Germany). Neue Technologien.
SOLAR ARRAYS FOR SMALL SCIENTIFIC SATELLITES
J. Koch *In* ESA Photovoltaic Generators in Space Jun. 1982 p 257-261 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The layout and manufacturing sequence of the arrays for the AMPTE 1 and OSCAR 9 satellites are described, and the handmade manufacturing approach is assessed. Handmade arrays need a higher manpower effort, trained qualified personnel, and longer manufacturing time for certain manufacturing steps (especially welding). Advantages include reduced tooling effort, higher flexibility e.g. at design changes, and shorter preparation time between project go ahead and manufacturing start. Application is limited to arrays with 2000 cells maximum. Author (ESA)

N83-14732*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETERMINATION OF OPTIMUM SUNLIGHT CONCENTRATION LEVEL IN SPACE FOR 3-5 CASCADE SOLAR CELLS
Henry B. Curtis *In* ESA Photovoltaic Generators in Space Jun. 1982 p 265-270 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Current-voltage curves were calculated for each cell in a cascade structure using a solar cell diode equation and superposition. Terms for the light generated current, diffusion current, space charge recombination current and series and shunt resistance are included. Individual current voltage curves are added in series with ohmic resistance losses for the cell interconnects to obtain the cascade cell performance. Temperature was varied with concentration, using several models, and ranged from 55 C at one Sun to between 80 and 200 C at 100 Suns. A variety of series resistance and internal resistances were used. Coefficients of the diffusion and recombination terms are strongly temperature dependent. The study indicates that maximum efficiency (30%) occurs in the 50 to 100X Sun concentration range, provided series resistance is below 0.015 ohm-sq cm and cell temperature is 80 C at 100 Suns. Author (ESA)

N83-14733# Societe Nationale Industrielle Aerospatiale, Cannes (France).
ARABSAT SOLAR ARRAY
R. Laget, C. Long, and P. Guyot *In* ESA Photovoltaic Generators in Space Jun. 1982 p 271-275 ref (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The electrical and mechanical performances of the ARABSAT medium class satellite solar array are described. Primary power (1.3 kW end of 7 yr life) is provided by two separate Sun-oriented solar array wings equipped with back surface reflector. The solar

generator is directly derived from graphite epoxy wing technology. It is suitable for telecommunication satellites owing to its very good power/mass ratio (21.4 W/kg), the three axis stabilization and the partial deployment of the solar array during transfer orbit.
Author (ESA)

N83-14734# European Space Research and Technology Center, Noordwijk (Netherlands).
OUTLOOK FOR SPACE ENERGY SYSTEMS AT THE END OF THE THREE-YEAR ASSESSMENT
D. Kassing *In* ESA Photovoltaic Generators in Space Jun. 1982 p 277-284 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

Satellite power transmission to Earth was studied. The technical feasibility and economic practicality of photovoltaic conversion subsystems are reviewed and consequences for Europe for future R and D in related areas are discussed. A satellite power system based on multiband gap GaAs cells is commercially feasible, although state of the art silicon cells could be used in early experiments. The concept is more attractive for Europe than for the United States, whose domestic energy production capacity is probably adequate for the next three or four decades.
Author (ESA)

N83-14735# British Aerospace Dynamics Group, Bristol (England).
SOLDERED SOLAR ARRAYS
Henry Charles Allen *In* ESA Photovoltaic Generators in Space Jun. 1982 p 287-289 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The ability of soldered interconnects to withstand a combination of long life and severe environmental conditions was investigated. Improvements in joint life from the use of solder mixes appropriate to low temperature conditons were studied. Soider samples were placed in a 150 C oven for 5 weeks (= 12 yr at 80 C, or 24 at 70 C according to Arrhenius's rule). Conventional and high solder melting point array samples underwent 1000 thermal cycles between -186 and 100 C. Results show that conventional and lead rich soldered arrays can survive 10 yr geostationary orbit missions.
Author (ESA)

N83-14736# British Aerospace Dynamics Group, Bristol (England). Space and Communications Div.
PROGRESS AND DEVELOPMENT STATUS OF THE SPACE TELESCOPE SOLAR ARRAY
R. H. W. Fox *In* ESA Photovoltaic Generators in Space Jun. 1982 p 263-298 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The development status of the Space Telescope solar array flexible solar cell blanket deployment mechanism, primary deployment mechanism and array orientation subsystems are reviewed. The array has a life time requirement of 5 yr. Design features include the ability to be operated manually in space and replaced as a complete unit in-orbit. Since the Space Telescope itself is too large to test in a conventional, satellite manner, thermal and dynamic analyses were used to prove the design. The deployed array inertia of 700 kg/sqm per wing and the extreme pointing accuracy requirement of the Space Telescope require an extremely sophisticated array orientation subsystem.
Author (ESA)

N83-14737# British Aerospace Dynamics Group, Bristol (England). Space and Communications Div.
FUTURE DEVELOPMENTS AND APPLICATIONS FOR THE SPACE TELESCOPE SOLAR ARRAY
R. H. W. Fox *In* ESA Photovoltaic Generators in Space Jun. 1982 p 299-303 (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

The adaptation of the Space Telescope solar array to experimental platforms or space shuttle limited duration missions is considered. Using the present design technology, a power growth up to 10 kW is envisaged. Geostationary orbit power versus mass for variants up to 8kW (10 year equinox) are shown. Power can be increased by adding solar panel assemblies (SPA) to the blankets. The present 8 in drum diameter and flexible power transfer harness enables a further SPA to be added by extending the Bi-Stem booms an additional 1.2 m, giving 6 kW beginning of life (BOL). By deletion when not required of shadow diodes (+4%) and the use of higher efficiency cells (+5%) a further power growth to 6.7kW BOL is possible with negligible impact on the present design, and qualification status. For increases of SPA above 6 per half wing, 24 total, the Bi-Stem size must be increased, Alternatively, Bi-Stem type and drum diameter increase may be possible. Both modifications are straightforward but require partial requalification.
Author (ESA)

N83-14738# British Aerospace Dynamics Group, Bristol (England).
ANTI-STATIC COAT FOR SOLAR ARRAYS
C. N. Fellas *In* ESA Photovoltaic Generators in Space Jun. 1982 p 305-307 refs (For primary document see N83-14694 05-44)
Avail: NTIS HC A15/MF A01

A Kapton based composite material, suitable as a substrate for flexible solar arrays, was designed, constructed and tested under electron energies ranging from 5 to 30 keV. The rear of the array under adverse eclipse conditions (-197 C) produced voltages well below the discharge threshold. An antistatic coat suitable as a front cover for solar arrays is also described. The thermal and optical transmission characteristics were tested and are satisfactory, but the UV and particle degradation of the Tedlar material needs to be evaluated.
Author (ESA)

N83-14739# Newcomb and Boyd, Atlanta, Ga.
CONTROLLING ENERGY CONSUMPTION IN SINGLE BUILDINGS Final Report, period ending May 1982
Jeff Rees Jul. 1982 111 p refs
(Contract N62583-81-MR-593)
(AD-A118898; NCEL-CR-82.028) Avail: NTIS HC A06/MF A01 CSCL 13/1

This report contains guidelines for using microprocessor-based equipment to control energy in buildings. Energy conservation control strategies are discussed and simplified energy savings calculations explained. The results of a survey of currently available equipment suitable for use as energy controllers is included as well as selection guidance for which class of equipment will provide the needed features.
GRA

N83-14740# Naval Civil Engineering Lab., Port Hueneme, Calif.
OPERATING AND MAINTENANCE EXPERIENCE WITH A 6-kW WIND ENERGY CONVERSION SYSTEM AT NAVAL STATION, TREASURE ISLAND, CALIFORNIA Technical Report, Sep. 1979 - Jun. 1981
D. Pal Jul. 1982 55 p
(AD-A119389; NCEL-TN-1641) Avail: NTIS HC A04/MF A01 CSCL 10/2

This report describes in detail the experience gained and lessons learned from the 6-kW grid-integrated Wind Energy Conversion System (WECS) demonstration at Naval Station, Treasure Island, San Francisco Bay. The objective of this demonstration was to develop operating experience and maintenance information on the 6-kW WECS using a combination of permanent magnet alternator with a line commutated synchronous inverter. The on-site measurements conducted during the demonstation indicate that the WECS site has annual average windspeeds of about 8 to 10 mph. The test results to data indicate a satisfactory performance of the WECS except for two failures involving arcing at the electrical terminals located on the yaw shaft. Due to wind characteristics encountered at the site, the performance data collected to date are at windspeeds of 20 mph or lower. For evaluating the WECS performance at all windspeeds, location at a windier site with annual average windspeeds of 14 mph or higher is recommended.
Author (GRA)

N83-14741# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
FUEL AND ELECTRICITY GENERATION FROM ILLUMINATION

OF INORGANIC INTERFACES Interim Technical Report
Mark S. Wrighton 27 Aug. 1982 39 p refs Submitted for publication Sponsored in part by DOE, GTE Labs. and Dow Chemical Co.
(Contract N00014-75-C-0880; NR Proj. 051-579)
(AD-A119305; TR-34) Avail: NTIS HC A03/MF A01 CSCL 07/2

Semiconductor-based photoelectrochemical devices represent good systems for the sustained, direct conversion of light to chemical or electrical energy. The interfacial structure, energetics, and and redox kinetics control the overall performance of such systems. Examples of improvements in efficiency and durability of photoelectrochemical cells stemming from chemical manipulations at semiconductor/liquid electrolyte interfaces illustrate the critical importance of understanding interface properties. Author (GRA)

N83-14742# EIC, Inc., Newton, Mass.
AMBIENT TEMPERATURE RECHARGEABLE LITHIUM BATTERY Final Report, 1 Mar. 1981 - 28 Feb. 1982
K. M. Abraham, D. I. Natwig, P. B. Harris, and J. W. Avery Fort Belvoir, Va. Army Electronics Research and Development Command Aug. 1982 102 p refs
(Contract DAAK20-81-C-0378; DA Proj. 1L1-62705-AH-94)
(AD-A119297; C-655; DELET-TR-81-0378-F) Avail: NTIS HC A06/MF A01 CSCL 10/3

Cr0.5V0.5S2 has been characterized as a useful positive electrode material for rechargeable Li cells. The positive electrode reaction involves intercalation of Li during discharge and deintercalation of Li during recharge. A discharge capacity equivalent to nearly le-/Cr0.5Vo.5S2 has been obtained in early cycles at low rates. The average capacity which could be realized in long-term cycling appears to be 0.7-0.8e-/Cr0.5V0.5S2. Laboratory cells exceeded 200 deep discharge cycles. Although Cr0.5V0.5S2 and its Li intercalates are good electronic conductors, optimum rate and rechargeability were found in electrodes with 15-20 weight percent carbon. Because of this relatively large amount of carbon, the volumetric energy density achieved in cells has been significantly lower than what was anticipated at the outset of the program. The major objective of the program, development of a technology base for the construction of large rechargeable Li cells, has been accomplished. Cells with theoretical capacities of 10 and 20 Ah have been constructed and tested. In limited cycle tests, these large cells performed as well as laboratory test cells. GRA

N83-14743# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
DEVELOPMENT OF IMPROVED SEPARATORS FOR ALKALINE ZINC BATTERIES Final Report
W. A. Parkhurst 28 Feb. 1982 18 p refs
(SF43431302)
(AD-A119150; AD-F500064; NSWC/TR-82-128) Avail: NTIS HC A02/MF A01 CSCL 10/3

This report is a summary of the development of separator materials for rechargeable alkaline zinc batteries over a seven year period. It summarizes studies performed during the earlier years of polyphenylquinoxaline (PPQ) polymer blends as separator materials. The expense of large scale production and the marginal improvement demonstrated for PPQ blends over existing cellulose based separator materials led to redirection of the work. The current limited effort in the development of nickel coated separator materials is described. Because of a lack of funding, the characterization of nickel coated separator materials was not completed. Further characterization, testing and evaluation of the feasibility of such electrically conductive separator film materials is recommended. GRA

N83-14744# Army Logistics Center, Fort Lee, Va.
INDEPENDENT EVALUATION PLAN (IEP) FOR SEALED NICKEL-CADMIUM (NICAD) BATTERY SUPPORT
7 Sep. 1982 34 p refs
(AD-A119555) Avail: NTIS HC A03/MF A01 CSCL 10/3

Test objectives were (1) to evaluate the POC and direct exchange procedures to provide responsive and effective battery support under combat conditions, and (2) to evaluate whether or not the PP-7286/U battery charger can charge the volume and diversity of type batteries under conditions utilizing the POC and established direct exchange procedures. GRA

N83-14745# Department of Energy, Washington, D. C. Wind Energy Technology Div.
PROSPECTS FOR FOREIGN APPLICATIONS OF WIND-ENERGY SYSTEMS, PRELIMINARY REPORT IN RESPONSE TO PUBLIC LAW 96-345
4 Nov. 1981 18 p refs
(DE82-007930; DOE/NBM-1005) Avail: NTIS HC A02/MF A01

Potential foreign applications were identified. Specific systems which would most closely match the applications requirements from a list of representative U.S. wind energy systems. The energy situation of each of 155 countries and 29 territories was reviewed. Wind resources availability for each country was assessed from existing data sources. The export potential was determined by analyzing a country's applications requirements, cost of alternative energy, financial condition, interest in the development of renewable energy technologies, and level of indigenous competition. DOE

N83-14746# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
GUST STRUCTURE ANALYSIS FOR WECS: DESIGN AND PERFORMANCE ANALYSIS
R. E. Akins Dec. 1981 156 p refs
(Contract DE-AC06-79ET-23007)
(DE82-005321; DOE/ET-23007/80/2) Avail: NTIS HC A08/MF A01

The gust structure of the wind at a mid-Atlantic coastal location is documented. Three definitions of gust structure are developed, and data corresponding to two distinct flow regimes, onshore and offshore, are presented. These two cases correspond to very different upwind terrain and offer two distinct flows at one site. Detailed three dimensional wind measurements, obtained using a 76-m meteorological tower located on the coast of the Atlantic Ocean at Wallops Island, Virginia, were utilized. In all instances the number of gusts per unit time increases with mean wind speed and turbulence intensity and decreases with increasing height. The duration of the gusts increases with height and mean wind speed; their amplitude decreases with height and increases with turbulence intensity. It may be possible to predict the amplitude of descrete gusts directly from information concerning the turbulence intensity. DOE

N83-14747# California Univ., Livermore. Lawrence Livermore Lab.
ENERGY AND TECHNOLOGY REVIEW
Jun. 1982 28 p refs
(Contract W-7405-eng-48)
(DE82-019371; UCRL-52000-82-6) Avail: NTIS HC A03/MF A01

Reviews of research programs are presented. Fast and precise measurement techniques to meet the demanding specifications for microsphere targets used in inertial confinement fusion experiments are described. A program in which a Raman spectroscopy microprobe is used to perform molecular structure analyses on submicron size particles is discussed. The first year of the controlled thermonuclear reactions program is reported. DOE

N83-14748# Oak Ridge National Lab., Tenn.
INDUSTRIAL THERMAL ENERGY STORAGE: WHAT ARE THE POSSIBILITIES?
M. Olszewski 1981 23 p refs Presented at Intern. Flame Res. Assoc. Meeting, Chicago, 5 Oct. 1981
(Contract W-7405-eng-26)
(DE82-001494; CONF-811058-1) Avail: NTIS HC A02/MF A01

Some of the identified applications for thermal energy storage (TES) in the industrial sector are presented. The TES is generally applicable in reject energy recovery and reuse systems where either the energy source or use exhibits a fluctuating pattern of availability or need. It is also applicable when a mismatch occurs

between the time that the heat is available and the time it is needed. DOE

N83-14749# Los Alamos Scientific Lab., N. Mex.
DESIGN AND TESTING OF A 13.75 MW CONVERTER FOR A SUPERCONDUCTING MAGNETIC-ENERGY-STORAGE SYSTEM
H. J. Boenig, R. D. Turner, C. L. Neft, and K. H. Sueker 1981 5 p refs Presented at the 9th Symp. on Engr. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002385; LA-UR-81-3132; CONF-811040-70) Avail: NTIS HC A02/MF A01

A 30 MJ superconducting magnetic energy storage system to act as a transmission line stabilizer is described. Two 6 MVA transformers and a 5.5 kA, + 2.5 kV converter connects the superconducting coil to the 13.8 kV bus and regulates the power flow between the coil and the three phase system. The design philosophy for the converter including its control and protection system is given. The converter was tested with 10% overvoltage at no load, with 10% overcurrent at zero output voltage and with a watercooled resistive load of about 1 MW. These test results show that the converter meets the expected full load operating conditions. DOE

N83-14750# Los Alamos Scientific Lab., N. Mex.
POWER FROM THE HOT-DRY-ROCK GEOTHERMAL RESOURCE
N. M. Becker, R. A. Pettitt, and R. H. Hendron 1981 30 p refs Presented at ASME/IEEE Joint Power Generation Conf., St. Louis, 4 Oct. 1981
(Contract W-7405-eng-36)
(DE82-000759; LA-UR-81-2842; CONF-811008-3) Avail: NTIS HC A03/MF A01

The history of the development of the first hot dry rock (HDR) reservoir is presented. Particulars on the surface piping and data collection system are described. It is found that the geothermal reservoir growth is due in large part to pressurization and thermophysical effects. The impedance to flow along the fractures within the reservoir decreases as thermal contraction and pressurization of the reservoir continue to open natural joints. Minimal environmental effects were noted as a result of closed system circulation; and the chemical quality of the geothermal fluid is good, in contrast to the corrosive geothermal fluids in many hydrothermal systems. It is found that an HDR system is operational, and is used to answer questions raised by the theoretical research. The types and options of power generation available are addressed. A binary fluid cycle that can use nonaqueous working fluids is an alternative to single or multiple flash systems. These nonaqueous fluids may fall within a large range of hydrocarbon, fluorocarbon, and organic fluids. The R-114 was tested in binary cycle at Fenton Hill and was chosen largely for its heat transfer characteristics and previous industrial experience. DOE

N83-14751# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
SMALL-SCALE ENERGY-TECHNOLOGY PROJECTS IN THE PACIFIC TERRITORIES: A CASE-STUDY REVIEW
Charles W. Case and Marcelino K. Actouka (Hawaii Univ.) Sep. 1981 47 p refs Presented at the Conf. on Ocean Resource Develop. in the Pacific, Honolulu, Hawaii, 13-15 Oct. 1981
(Contract W-7405-eng-48)
(DE82-001338; LBL-12818; CONF-811053-1) Avail: NTIS HC A03/MF A01

A small-scale energy projects funded in the Pacific Territories attempts to be appropriate for developing Pacific island communities by using local labor and materials, using renewable resources, incorporating simple technologies, and being culturally sensitive. During the last three years the projects were monitored. Five case studies were prepared which illustrate elements and define features which contribute or hinder technology transfer. Case studies include a typhoon-proof greenhouse on Guam, wood stoves and small solar devices on Yap, various devices built at a youth educational facility on Ponape, an unusual solar hot water system on Majuro, and a solar fish drying facility on an outer Truk island. DOE

N83-14752# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
CATALYTIC LIQUEFACTION OF BIOMASS
Hubert Davis, Carlos Figueroa, Cihan Karatas, Dieter Kloden, Larry Schaleger, and Nasser Yaghoubzadeh Oct. 1981 29 p refs Presented at the 13th Biomass Thermochem. Conversion Contractors Meeting, Washington, D.C., 27-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003329; LBL-13449; CONF-8110115-1) Avail: NTIS HC A03/MF A01

The bench scale continuous liquefaction unit (CLU) in operation as a back mixed reactor. It is used to explore a factional experiment in temperature, time, slurry pH, gas to slurry feed ratio and other variables. It is available for a wide range of biomass or even fossil feedstocks. New methods of characterizing oil and water soluble products were developed and applied to CLU products. Conditions under which formate ion, probable intermediate in both water gas shift reaction and reduction of biomass oxygen by CO, is formed in large quantities are found. Raw wood chips undergo solvolysis, total dissolution, when mixed with wood liquefaction oil and heated under certain conditions. This phenomenon must occur to some degree in the initial stages of the PERC process. It is suggested that solvolysis is a possible way to get the benefits of oil recycle. Without the uneconomically high recycle ratios of the PERC process. DOE

N83-14753# Delaware State Solid Waste Authority, Dover.
ENERGY RESOURCE RECOVERY FACILITY FOR KENT AND SUSSEX COUNTIES, DELAWARE
Nov. 1981 180 p Prepared jointly with CSI Resource Systems, Inc.
(Contract DE-FG01-79CS-20234)
(DE82-002539; DOE/CS-20234-1) Avail: NTIS HC A09/MF A01

An outline of factors which should be considered in planning a solid waste facility is presented. The following topics are considered: (1) information on the technical findings; (2) existing waste disposal facilities, future systems, and waste characteristics; (3) markets for the waste resources are identified; (4) presents a rational means for site evaluation by assigning numerical values to four principal factors in decision making; (5) the refuse derived fuel system and the modular combustion system is described; (6) risks and implementation issues for the most promising systems are identified. DOE

N83-14754# Pacific Northwest Lab., Richland, Wash.
AQUIFER STABILITY INVESTIGATION
R. D. Allen and T. J. Doherty Sep. 1981 18 p refs Presented at Compressed Air Energy Storage Seminar, Chicago, 17 Sep. 1981
(Contract DE-AC06-76RL-01830)
(DE82-003831; PNL-9884; CONF-810997-2) Avail: NTIS HC A02/MF A01

The reservoir Stability Studies Program had four major activities: a state-of-the-art survey to establish preliminary stability criteria and identify areas requiring research and development; numerical modeling; laboratory testing to provide data for use in numerical models and to investigate fundamental rock mechanics, thermal, fluid, and geochemical response of aquifer materials; and field studies to verify the feasibility of air injection and recovery under CAES conditions in an aquifer, to validate and refine the stability criteria, and to evaluate the accuracy and adequacy of the numerical and experimental methodologies developed in previous work. Three phases of study, including preliminary criteria formulation, numerical model development, and experimental assessment of CAES reservoir materials have been completed. Present activity consists of construction and operation of the aquifer field test, and associated numerical and experimental work in support of that activity. DOE

N83-14755# Pacific Northwest Lab., Richland, Wash.
ADVANCED CONCEPTS: THE SECOND GENERATION OF COMPRESSED AIR-ENERGY STORAGE TECHNOLOGY
L. D. Kannberg Sep. 1981 12 p refs Presented at Compressed Air Energy Storage Seminar, Chicago, 17 Sep. 1981
(Contract DE-AC06-76RL-01830)
(DE82-003838; PNL-SA-9885; CONF-810997-1) Avail: NTIS HC A02/MF A01

A description and assessment is provided for four second generation compressed air energy storage (CAES) concepts; abiabatic CAES, hybrid CAES, CAES with coal gasification (CG), and CAES with pressurized fluidized bed combustion (PFBC). These are based on information provided in conceptual design studies performed by Acres American, Inc., United Engineers and Constructors, and United Technologies Research Center. The assessment covers consideration of the technological readiness, relative economic benefits and operational viability of each concept. It was concluded that the adiabatic CAES concept appears to be the most attractive candidate for utility application in the near future. It is operationally viable, economically attractive compared with competing concepts, and will require relatively little additional development before commercialization. It was estimated that a utility could start the design of a commercial plant in 2 to 3 years if research regarding TES system design is undertaken in a timely manner. DOE

N83-14756# Sandia Labs., Albuquerque, N. Mex.
THE 17-M VAWT PROGRAM
R. O. Nellums 1981 22 p refs Presented at the 5th Biennial Wind Energy Conf. and Workshop, Washington, D.C., 5 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003497; SAND-81-1756C; CONF-811043-11) Avail: NTIS HC A02/MF A01

The commercial potential of the 17 m, 100 kW Darrieus Vertical Axis Wind Turbine (VAWT) is discussed. Long term testing is in progress. As the first commercially adapted Darrieus turbines built by DOE, the superior cost, structural integrity, and output characteristics demonstrated by the prototypes appear particularly promising. DOE

N83-14757# Pacific Northwest Lab., Richland, Wash.
ENVIRONMENTAL AND REGULATORY ASPECTS OF COMPRESSED-AIR ENERGY STORAGE
M. A. Beckwith and J. Mathur 1981 10 p refs Presented at Intern. Energy Storage Conf., Seattle, 19 Oct. 1981
(Contract DE-AC06-76RL-01830)
(DE82-003868; PNL-SA-9500; CONF-811066-4) Avail: NTIS HC A02/MF A01

The effects of fuel regulations, environmental protection laws, the National Environmental Policy Act, underground injection regulations, and state regulations on the development of compressed air storage systems and power plants are discussed. It is concluded that environmental regulatory concerns of conventional energy technologies are often different from those associated with new technologies such as compressed air energy storage (CAES). Confusion and uncertainty often results when the current environmental regulatory system is applied to new technologies. Evolution of the regulatory system must accompany and rapidly accommodate technological development if the benefits of such development are to be fully realized in a timely manner. Those responsible for technological development in the energy field must be aware of these disparities and conduct their efforts accordingly. DOE

N83-14758# Pacific Northwest Lab., Richland, Wash.
ECONOMIC COMPARISON OF CAES DESIGNS EMPLOYING HARDROCK, SALT AND AQUIFER STORAGE RESERVOIRS
Raymond W. Reilly and Robert B. Schainker (Electric Power Research Inst.) 1981 9 p refs Presented at the Compressed Air Energy Storage Seminar, Chicago, 17 Sep. 1981
(Contract DE-AC06-76RL-01830)
(DE82-003833; PNL-SA-9890; CONF-810997-3) Avail: NTIS HC A02/MF A01

The economic performance of three compressed air energy storage (CAES) designs is briefly examined. Each design was developed under different assumptions and constraints, and each employed a different ytpe of air storage facility: a hardrock-mined cavity, a solution mined salt deposit, and an aquifer. The results indicate that aquifer and salt storage facilities cost roughly 60 to 70% of the equivalent hardrock mined cavern. In this comparison the aquifer storage facility was somewhat less expensive than the salt cavity, but this difference could be reversed with different salt and/or aquifer characteristics. For instance, if the aquifer was less permeable, then more wells would be required for the same power level, and total storage cost would be higher. The major difference between the plant cost estimates lies not in the cost of storage facilities, but rather in vendor estimates of turbomachinery cost. And, since turbomachinery contributes about half of total plant cost, this difference could be critical to the decision to build a CAES plant. DOE

N83-14759# Sandia Labs., Albuquerque, N. Mex.
PARAMETRIC BEHAVIOR OF THE CIRCULATING ZINC-BROMINE BATTERY
E. Kantner, R. Bellows, H. Einstein, P. Grimes, P. Malachesky, and K. Newby 1981 17 p refs Presented at Electrochem. Soc. General Session, Pennington, N. J., 11 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-001910; SAND-81-7158C; CONF-811084-1) Avail: NTIS HC A02/MF A01

Graphs are presented depicting polarization data of bipolar batteries of varying capacity ratings, battery voltage vs c/d time of bipolar batteries of varying capacity ratings. Coulomb efficiency vs zinc loading, Coulomb efficiency vs c/d rate, voltage efficiency vs c/d rate, and energy efficiency vs c/d rate. DOE

N83-14760# Sandia Labs., Albuquerque, N. Mex.
AERODYNAMICS AND PERFORMANCE TESTING OF THE VAWT
P. C. Klimas 1981 11 p refs Presented at the 5th Biennial Wind Energy Conf. and Workshop, Washington, D.C., 5 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003574; SAND-81-1702C; CONF-811043-9) Avail: NTIS HC A02/MF A01

Relatively inexpensive changes to the current aerodynamic design which may bring about reductions in cost of energy (COE) and increases in reliability for VAWT systems are discussed. This design uses blades of symmetrical cross section mounted such that the radius from the rotating tower centerline is normal to the blade chord at roughly the 40% chord point. The envisioned changes to this existing design are intended to: (1) lower cut in windspeed; (2) increase maximum efficiency; (3) limit maximum aerodynamic power; and (4) limit peak aerodynamic torques. Experiments to better understand the aerodynamics of a section operating in an unsteady, curvilinear flowfield and achieve some of the desired changes in section properties are described. DOE

N83-14761# Sandia Labs., Albuquerque, N. Mex.
DEVELOPMENT EFFORT OF SHEET MOLDING COMPOUND (SMC) PARABOLIC TROUGH PANELS
P. A. Kirsch (Budd Co., Fort Washington, Pa.) and R. L. Champion 1982 17 p refs Presented at the 37th Ann. Tech. Conf. on Reinforced Plastics/Composites, Washington, D.C., 11 Jan. 1982
(Contract DE-AC04-76DP-00789)
(DE82-000841; CONF-820103-1) Avail: NTIS HC A02/MF A01

The approach taken to meet the objectives was to design the parabolic panel, fabricate a prototype die, choose an SMC formulation and mold the glass and SMC together into a vertex to rim mirrored panel. The main thrust of the program was to successfully co-mold a mirrored glass sheet with the SMC. Results indicate that mirrored glass sheets, if properly strengthened to withstand the temperature and pressure of the molding process, can be successfully molded with SMC in a single press stroke using standard compression molding techniques. The finalized design of the trough panel is given. The SMC formulation chosen is a low shrink, low profile SMC using 40% by weight one inch chopped glass fibers in a uv stabilized polyester resin matrix. A

program to test for the adhesion between mirrored glass sheets and the SMC is discussed briefly. DOE

N83-14762# Lincoln Housing Authority, Nebr.
RESIDENTIAL PHOTOVOLTAIC EXPERIMENT STATION DATA SYSTEM
Harvey A. Fenton and Carl H. Much 1981 7 p Presented at IECI '81, San Francisco, 9-12 Nov. 1981
(Contract DE-AC02-76ET-20279)
(DE82-001646; DOE/ET-20279-155; CONF-811110-2) Avail: NTIS HC A02/MF A01

A microprocessor-based system acquires data from and controls residential photovoltaic power system evaluation experiments. Each station monitors 30 or more experiment sites. Unique features are the use of data from one site to control another and the easy addition, removal, or modification of sensors or sites without disruption of the system. DOE

N83-14763# AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien, Raumfahrt.
SYSTEM ANALYSIS, DESIGN, CONSTRUCTION AND COMMISSION OF A PHOTOVOLTAIC POWER PLANT FOR SUPPLY OF BROADCASTING EQUIPMENT Final Report, Apr. 1981
Desmond Keaveny Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 124 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-125; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,50

A photovoltaic power plant to supply a broadcasting transmitter was designed, built and tested in order to validate the application of photovoltaic power plants for the self sufficient power supply of broadcasting equipment. Berlin was chosen for data collection and field testing. A 600 W transmitter was installed as load. After construction and commissioning, the plant, (solar generator, energy conditioning and control, storage battery, and transmitter) was tested for 1 yr. The field testing demonstrates that in Central European latitudes photovoltaic power plants can guarantee a self supporting operation of broadcasting equipment. Author (ESA)

N83-14764# Schott Glaswerke, Mainz (West Germany).
FLAT PLATE SOLAR COLLECTORS Final Report, Jul. 1980
Eckart Hussmann Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 100 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-139; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

Flat plate collectors of conventional design with high efficiency were developed. A special metal sheet fastened to the absorber led to a construction which is gas tight and tolerates no flow conditions. Such collectors have a long service life. The influence of the cover system on efficiency was investigated by computer simulation. The type of panel, the number and selective coatings on the panel or on the absorber were varied. Loads from the environment and operating loads e.g., pressure rise related to temperature rise and thermal stresses were analyzed, especially for cover systems and the bonding of the panels, to the absorber. Prototypes were built and tested. Author (ESA)

N83-14765# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
REGIONAL ENERGY PLANNING: SOME SUGGESTIONS TO PUBLIC ADMINISTRATION [PIANIFICAZIONE ENERGETICA TERRITORIALE: ALCUNI SUGGERIMENTI AGLI AMMINISTRATORI PUBBLICI]
R. Sozzi 1982 21 p In ITALIAN Presented at Sem. sul Piano per l'Uso Razionale dell'Energia in Emilia-Romagna, Bologna, 21 May 1982
(CISE-1795) Avail: NTIS HC A02/MF A01

A methodology is proposed to estimate the relevant data and to improve the energy efficiency in regional energy planning. The quantification of the regional energy system is subdivided in three independent parameters which are separetely estimated: energy demand, energy consumption, and transformation capacity. Definitions and estimating procedures are given. The optimization of the regional planning includes the application, wherever possible, of the technologies which centralize the space-heating energy production or combine the production of electric energy with space-heating energy distribution. Author (ESA)

N83-14766# Department of Energy, Richland, Wash.
DRY/WET PERFORMANCE OF A PLATE-FIN AIR COOLED HEAT EXCHANGER WITH CONTINUOUS CORRUGATED FINS Final Report
S. G. Hauser, D. K. Kreid, and B. M. Johnson Apr. 1982 180 p refs Prepared in cooperation with Batelle Pacific Northwest Lab.
(Contract EPA-IAG-79-DX-0676)
(PB82-231424; EPA-600/7-82-014) Avail: NTIS HC A09/MF A01 CSCL 13A

Work to determine experimentally the performance and operating characteristics of a plate-fin heat exchanger during dry/wet of deluge operation is discussed, as well asthe development of the deluge heat/mass transfer model. The work supports the improvement of power plant cooling systems that conserve fresh water in an environmentally and economically viable manner. The experiments identified important trade-offs concerning deluge cooling; these are discussed. The earlier deluge model was refined and extended to the simultaneous calculation of heat transfer and evaporation from wetted surfaces. Experiments showed the model to be an excellent predictor of heat exchanger performance during deluge operation. GRA

N83-14343*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POTENTIAL AVAILABILITY OF DIESEL WASTE HEAT AT ECHO DEEP SPACE STATION (DSS 12)
R. D. Hughes *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 166-182 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 10B

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N83-14767# General Accounting Office, Washington, D. C.
CLEANING UP THE ENVIRONMENT: PROGRESS ACHIEVED BUT MAJOR UNRESOLVED ISSUES REMAIN
21 Jul. 1982 69 p refs 2 Vol.
(GAO/CED-82-72; B-207657) Avail: NTIS HC A04/MF A01

Air quality, water quality, solid waste disposal, ocean dumping, and noise abatement are discussed. Acid precipitation, nonpoint sources of water pollution, ground water contamination, ocean waste disposal, compliance, and pollution control decisions comprise a list of unresolved issues. N.W.

N83-14768# Comptroller General of the United States, Washington, D.C.
CLEANING UP THE ENVIRONMENT: PROGRESS ACHIEVED BUT MAJOR UNRESOLVED ISSUES REMAIN. VOLUME 2 Report to the Congress
21 Jul. 1982 60 p
(GAO/CED-82-72) Avail: SOD HC $3.25

Sewer systems, drinking water quality, solid waste disposal, noise control, and other factors in Cleveland, Dallas, and New York City are reviewed. N.W.

N83-14769# General Accounting Office, Washington, D. C.
FRESH LOOK IS NEEDED AT SOUTH FLORIDA JETPORT
15 Jun. 1982 68 p refs

(GAO/CED-82-54; B-204739) Avail: NTIS HC A04/MF A01; SOD HC $3.25

The need to renegotiate the Jetport Pact is discussed (an agreement between the United States, the State of Florida, and Dade County, Florida) in light of changed conditions and the need to resolve certain operational questions concerning the suitability of the site selected for a new jetport in south Florida. Because the Federal Aviation Administration's intent is to seek 100 percent Federal funding to carry out the terms of the Pact, the Congress will ultimately have to decide whether to appropriate funding. This review was made to assist the Congress in evaluating the Jetport Pact and in determining what action to take if and when funding to carry out the Pact is requested. Author

N83-14770# General Accounting Office, Washington, D. C. Energy and Minerals Div.

NUCLEAR AND COAL WASTE DISPOSAL HAMPERED BY LEGAL, REGULATORY AND TECHNICAL UNCERTAINTIES

4 May 1982 4 p refs

(EMD-82-63; B-204622) Avail: NTIS HC A02/MF A01; also available from SOD HC $3.25

Numerous legal, regulatory, and technical problems and uncertainties are hampering disposal of nuclear and coal fuel cycle wastes. The following issues are investigated: problems associated with waste collection and disposal, present technical capability of waste collection and disposal, present capability of the transportation system to transport wastes, disposal, regulations and uncertainties affecting waste disposal, and current status of programs aimed at resolving these issues. L.F.M.

N83-14771# General Accounting Office, Washington, D. C. Community and Economic Development Div.

NEED TO STRENGTHEN COORDINATION OF OCEAN POLLUTION RESEARCH

14 Jul. 1982 4 p refs

(GAO/CED-82-108; B-203956) Avail: NTIS HC A02/MF A01; also available from SOD HC $3.25

A review of the National Oceanic and Atmospheric Administration's (NOAA's) implementation of the National Ocean Pollution Planning Act (Public Law 95-273, approved May 8, 1978) was recently completed. The act directs NOAA to prepare and periodically revise a plan for coordinating Federal ocean pollution research . It was found that the plan could be a more effective instrument for coordination if the National Ocean Pollution Planning Act were strengthened and if certain changes were made to the plan itself. At a minimum, the act needs to be amended to give NOAA, or an interagency coordinating committee chartered by the act, authority to review Federal agency research budgets before they are approved by the Office of Management and Budget (OMB). Future plans need to specify in more detail how limited Federal research money should be allocated and how responsibilities should be divided by agencies exploring similar ocean pollution issues to avoid unintended duplication or inefficiently organized research. Author

N83-14772# Research Triangle Inst., Research Triangle Park, N.C.

BOILER EFFICIENCY AND EMISSIONS TESTING USING REFUSE-DERIVED FUEL (RDF) AND COAL Final Report, 21-26 Feb. 1982

Brooks AFB, Tex. AFOEHL Aug. 1982 54 p Prepared in cooperation with Entropy Environmentalists, Inc.

(Contract F33615-80-D-4000; AF Proj. 1955)

(AD-A119291; RTI-43U-1955-14; OEHL-TR-82-017EA206HEF) Avail: NTIS HC A04/MF A01 CSCL 13/1

This report is an evaluation of (1) boiler performance, i.e., boiler efficiency and combustion properties; and (2) environmental emissions, i.e., electrostatic precipitator performance, particulate emissions (size and resistivity), gaseous emissions (SOx, NOx, CO and HC) and trace organics; while burning the following three fuel combinations at maximum boiler capacity; (1) 100% coal, (2) 40/60 refuse-derived fuel (RDF) to coal; and (3) 100% RDF. Author (GRA)

N83-14773# Army Construction Engineering Research Lab., Champaign, Ill. Environmental Div.

THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT MANAGEMENT SYSTEM: PILOT SYSTEM DESCRIPTION Final Report

M. Messenger, V. Scarpetta, C. Corbin, J. Bandy, E. Smith, and R. Webster Aug. 1982 22 p refs

(DA Proj. 4A7-62720-A-896)

(AD-A119787; CERL-TR-N-133) Avail: NTIS HC A02/MF A01 CSCL 13/2

The Clean Water Act of 1977 and Army Regulation 200-1 require Army installations to control the quality of their point-source wastewater effluents. Point-source discharges are controlled by National Pollutant Discharge Elimination System (NPDES) permits; each wastewater point discharging into a navigable waterway is regulated either by a Federal or State NPDES permit. The Department of the Army has been issued hundreds of NPDES permits. The report describes a pilot NPDES Permit Management System developed by the U.S. Army Construction Engineering Research Laboratory (CERL). This program allows the Army to retrieve from a central data base a permanent, continually updated inventory of the Army's wastewater effluent discharge self-monitoring information and associated NPDES permit data. This system also lets the Army aggregate, manipulate, and analyze the data base information. This report gives a brief background of the pilot system's development, suggests how the system can be used to help manage the Army's pollution abatement program, and gives detailed user instructions. Author (GRA)

N83-14774# Monsanto Research Corp., Miamisburg, Ohio.

TRITIUM WASTE CONTROL: OCTOBER 1980 - MARCH 1981

Paul H. Lamberger and Michael L. Rogers 19 Oct. 1981 18 p refs

(Contract DE-AC04-76DP-00053)

(DE82-002088; MLM-2844) Avail: NTIS HC A02/MF A01

The Combined Electrolysis Catalytic Exchange (CECE) pilot system was operated for 88 days and processed over 500 liters of tritiated water. Two complete electrolysis systems, each using a General Electric Company solid polymer electrolyte (SPE) cell, have been built. One of these is being used for the 10 Ci/ml tritiated water test and the other as a control with nontritiated water. The first SPE failed after seven weeks of exposure to the 10 Ci/ml water. A new SPE was installed and has been operated for eight weeks without failure at 10 Ci/ml. Analyses for 10 types of impurities were made on each of 15 Effluent Recovery System (ERS) liquid waste samples. A pilot-scale system for removal of these impurities has been designed and is being built. Gas generation rates caused by radiolysis of tritium waste materials were determined for polymer and nonpolymer impregenated tritiated concrete. The construction of the new addition to the liquid waste handling facility was completed. DOE

N83-14775# Pennsylvania State Univ., University Park. Dept. of Chemistry.

DEVELOPMENT OF INSTRUMENTAL METHODS OF ANALYSIS OF SULFUR COMPOUNDS IN COAL PROCESS STREAMS Final Technical Report, 30 Sept. 1977 - 29 Sep. 1981

J. Jordan 1981 12 p refs

(Contract DE-AC22-77ET-10482)

(DE82-003253; DOE/ET-10482/T4) Avail: NTIS HC A02/MF A01

The general objective was resource development in the analytical chemistry of sulfur compounds for the evolving new coal technologies. Based on fundamental considerations, judiciously selected methods of instrumental analysis were developed for determining sulfur compounds in coal conversion process streams. Significant sulfur moieties were identified with the aid of thermodynamic criteria, taking into account the blocking of some equilibria by sluggish kinetics. Two discrete types of procedures were developed for selected moieties, viz., (1) enthalpimetric methods, which rely on measurements of heats of reaction in adiabatic cells; (2) voltammetric methods, using glassy carbon indicator electrodes. Stability domains of thirty-six (36) inorganic

sulfur compounds were mapped as functions of redox potential and pH. Based on this information, the occurrence probability of specified sulfur contaminants in coal conversion streams was assessed. DOE

N83-14776# Pennsylvania State Univ., University Park. Dept. of Chemistry.
DEVELOPMENT OF INSTRUMENTAL METHODS OF ANALYSIS OF SULFUR COMPOUNDS IN COAL-PROCESS STREAMS Quarterly Progress Report, Jul. - Sep. 1981
Joseph Jordan, John Stahl, and J. E. Yakupkovic Oct. 1981 35 p refs
(Contract DE-AC22-77ET-10482)
(DE82-003291; DOE/ET-10482/T3) Avail: NTIS HC A03/MF A01

The polarography of mixtures containing HS(-1), S4(-2) and S5(-2) was investigated at the dropping mercury electrode in aqueous supporting electrolytes of pH 8.7 and 9.4. Cathodic waves were obtained which exhibited a large polarographic maximum, followed by a well-defined limiting current region. The limiting current was proportional to the sum of [S4(-2)] + [S5(-2)] anomaly that interfered at pH 12, viz., a dip in the limiting current spanning half a volt, was minimized at pH less than 9. Thermochemical data collection, storage, and analysis were fully computerized. Thermometric enthalpy titration curves (TET) were computer corrected to yield an enthalpogram in terms of net heats of chemical reactions plotted versus time. Non-idealities such as heat capacity changes and extraneous heat losses were automatically compensated. A thermochemical method for determining polysulfides, utilizing HMB as a titrant, was validated in an aqueous coal liquefaction process stream. DOE

N83-14777# Oak Ridge National Lab., Tenn.
PSEUDO-SPECTRAL TECHNIQUE IN THE COMPUTATION OF SEASONAL AVERAGE CONCENTRATIONS AND ITS COMPARISON WITH THE TRAJECTORY TECHNIQUE
B. D. Murphy 1981 20 p refs Presented at the 12th NATO/CCMS Intern. Tech. Meeting on Air Pollution Modeling and its Appl., Menlo Park, Calif., 25 Aug. 1981
(Contract W-7405-eng-26)
(DE82-001489; CONF-810841-4) Avail: NTIS HC A02/MF A01

Codes were designed to study the long range movement of material in the atmosphere. The ORNL code RETADD is an example such a code. Codes such as RETADD operate by following wind trajectories which advect material from a source location and which superimpose a diffusion rate upon the advection process. By storing the results of many trajectory passes, average patterns of ground level concentration are deduced; and by repeating the process, the average pattern resulting from a combination of a number of sources can be deduced. Many current problems require the analysis of the fate of atmospheric effluents associated with a given technology. DOE

N83-14778# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
EFFECTS OF ACID PRECIPITATION ON ELEMENTAL TRANSPORT FROM TERRESTRIAL TO AQUATIC ECOSYSTEMS
Dale W. Johnson 1981 9 p refs Presented at the Intern. Conf. on Energy Use Management, 3, West Berlin, 26 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002739; CONF-811006-7) Avail: NTIS HC A02/MF A01

Significant progress was made in terrestrial aquatic transport methodology. Several techniques and conceptual frameworks are available for assessment of acid rain effects on these transport processes. It is possible to assess the relative effects of acid rain vs natural, internal acid production on elemental transfer rates is assessed by anion model. Sensitivity must be defined for ecosystem and effects that are considered. Criteria are developed, but there is a major need for more information on natural acid production. DOE

N83-14779# Oak Ridge National Lab., Tenn.
ASSESSING THE EFFECTS OF CONTAMINANTS ON THE STRUCTURE AND FUNCTION OF AQUATIC ECOSYSTEMS
J. M. Giddings 1981 19 p refs Presented at the ORNL Symp. on the Environment and Solid Wastes: Characterization, Treatment, and Disposal, Gatlinburg, Tenn., 4 Oct. 1981
(Contract W-7405-eng-26)
(DE82-001466; CONF-811060-1) Avail: NTIS HC A02/MF A01

The range of potential interactions between chemical pollutants and aquatic ecosystems are discussed. Bioassays, population interactions, and disruptions in nutrient and energy flow are discussed. It is argued that the processes of the entire ecosystem must be studied in order to arrive at an adequate assessment of environment impacts. DOE

N83-14780# Brookhaven National Lab., Upton, N. Y.
USE OF THE PSEUDO-SPECTRAL TECHNIQUE IN AIR-POLLUTION MODELING
A. A. N. Patrinos and M. J. Leach 1982 4 p refs Presented at the 3rd Joint Conf. on Appl. of Air Pollution Meteorol., San Antonio, 11-15 Jan. 1982
(Contract DE-AC02-76CH-00016)
(DE82-030525; BNL-30033; CONF-820101-2) Avail: NTIS HC A02/MF A01

The pseudo-spectral method for the solution of the dispersion equations offers advantages over the more established finite difference schemes. The main advantage of this method is the superior accuracy in the representation of the spatial derivatives; the only limit is the extent to which a distribution can be represented on a finite set of meshpoints. The pseudo-spectral method is based on the expansion of the dependent variables in terms of orthogonal functions, with the use of finite Fourier series expansions becoming increasingly frequent due to the development of the fast Fourier transform (FFT). Two serious drawbacks of the pseudo-spectral method are addressed, and suggestions for improvement are offered. DOE

N83-14781# Battelle Pacific Northwest Lab., Sequim, Wash. Marine Research Lab.
COAL FLY ASH DISPOSAL IN THE OCEAN: AN ALTERNATIVE WORTH CONSIDERING
E. A. Crecelius 1981 20 p refs Presented at the 3d Intern. Ocean Dumping Symp., Woods Hole, Mass., 12 Oct. 1981
(Contract DE-AC06-76RL-01830)
(DE82-003835; PNL-SA-9657; CONF-8110104-3) Avail: NTIS HC A02/MF A01

Chemical and biological experiments measured the solubility of 16 elements in coal fly ash and the short-term toxicity of coal fly ash to clams and phytoplakton. Of the elements studied, 10 to 60% of the As, Br, Cr, Sb, Se, Ni, Pb, and Sr dissolved within a 24-hour period. Elements which were less than 10% soluble in 24-hours included Cu, Zn, Na, La, Sc, Fe, Co and Eu. Littleneck clams (Protothaca staminea) were exposed to coal fly ash in flowing seawater for a 25-day period. The addition of soluble coal fly ash material had no effect on the carbon uptake rate of phytoplakton. These measurements were made in the productive Washington shelf water during August. The literature indicates coal fly ash has a relatively low toxicity to plants and animals. Disposal methods could be designed so water quality criteria levels would not be exceeded except in the immediate vicinity of the dumpsite. DOE

N83-14782# ESTEL Huettenwerke Dortmund A.G., Dortmund (West Germany). Abt. Umwelttechnik.
A SPECIAL SINTER PLANT FOR (BOF) SLUDGE AGGLOMERATION Final Report, May 1981
Michael Kuehn Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 83 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-122; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

Handling of convertor sludges in sintering plants, sintering, and waste gas cleaning were investigated in order to get an

extensive documentation about the related problems. The test data are tabulated. A concept for a special sintering plant, which provides an excellent data basis for further projects, was developed.
Author (ESA)

N83-14783# Grosskraftwerk A.G., Mannheim (West Germany). Abteilungsleitung Forschung und Entwicklung.
IMPROVEMENT OF ELECTROSTATIC PRECIPITATORS PERFORMANCE THROUGH CONDITIONING BY FLUE GAS Final Report, Apr. 1981
Egon Jury Bonn Bundesministerium fuer Forschung und Technologie Jul. 1982 63 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-123; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,50

The influence of conditioning of flue gas by water on the performance of electrostatic precipitators was investigated in connection with power station precipitators, since the increasing use of coal of varying characteristics may considerably aggravate operating conditions. After the air preheater, water is injected through spraying nozzles into an evaporation vessel to cool down the flue gas. The precipitator efficiency rises, e.g. with flue gas cooled down from 154 to 90 C, from 89 to 97.6 %. The plant worked troublefree for 22 months. Conditioning by water can be applied in the case of cyclone boilers. The precipitator size can be reduced. The reduction of the temperature permits an adaptation to the coal characteristics. Author (ESA)

N83-14784# Research Inst. of National Defence, Umea (Sweden).
NORMAL OPERATION AND MODEL AVERAGE AT THE SAKAB PLANT IN NORRTROP. PRELIMINARY ANALYSIS OF PROTECTION AGAINST EMISSION OF SUBSTANCES DANGEROUS TO HEALTH AND ENVIRONMENT. PART 3: SUMMARY [NORMALDRIFT OCH MODELLHAVERIER VID SAKABS ANLAEGGNING I NORRTORP. PRELIMINAER ANALYS AV AATGAERDER MOT UTSLAEPP AV HAELSO- OCH MILJOEFARLIGA AEMNEN. DEL 3: SAMMANFATTANDE RAPPORT]
Olof Granbom, Goeran Arnoldsson, Jan-Olof Andersson, Stellan Marklund, Lars Trogen, and Edvard Karlsson Jan. 1982 16 p In SWEDISH
(FOA-A-40039-C1) Avail: NTIS HC A02/MF A01

Steps to prevent emission of substances dangerous to health and environment from an incinerator were studied for a series of conditions which included serious accidents. Continuous, long term emission of poisonous substances in very low concentration, generated by incomplete combustion, is considered as the highest emission hazard. The greatest health hazards from receiving depots and storage are fire emergencies caused by poisonous substances. Author (ESA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N83-14785 Minnesota Univ., Minneapolis.
ELECTRODYNAMICS OF THE PLASMA FLOW REVERSAL IN THE LATE EVENING AURORAL OVAL Ph.D. Thesis
Dennis Arthur Behm 1982 161 p
Avail: Univ. Microfilms Order No. DA8221246

Electric and magnetic field measurements taken by two Nike-Tomahawk sounding rockets, launched from Andoya, Norway into the late evening auroral oval, are presented. Flight 18.1005, launched into quiet magnetic conditions, passed over a quiet auroral arc and over a region of plasma flow reversal. The flow reversal was interpreted as the Harang discontinuity. The second flight, 18.1004, was launched into a breakup aurora and through the westward electrojet. Horizontal current strengths were inferred from dc magnetic field measurements and calculated from the measured dc electric field and calculated conductivities for both flights. The calculated currents disagreed with the magnetic field measurements. The disagreement was larger for flight 18.1004, supporting the conclusion that neutral winds play a role in driving horizontal currents. A major emphasis was placed on the performance of the triaxial fluxgate magnetometer as compared to the proton precession magnetometer. It was shown that northward and vertical magnetic field components could be obtained with some difficulty, but that determination of the eastward component was not possible. Dissert. Abstr.

N83-14786 California Univ., Los Angeles.
MULTIPLE STATIONARY AND STATISTICAL EQUILIBRIA OF A THERMALLY FORCED BAROCLINIC ATMOSPHERE Ph.D. Thesis
Chi-Sann Egon Liou 1982 245 p
Avail: Univ. Microfilms Order No. DA8219720

Multiple stationary and statistical equilibria of an idealized, thermally forced atmosphere are studied using a quasi-geostrophic two level model applied to a zonal channel on beta plane with a sinusoidal topography as the lower boundary. The model is spectrally truncated retaining only one zonal wavenumber and either one or three meridional modes. In the truncation that retains only the first meridional mode, three (stationary) equilibria are found when the external thermal forcing is greater than a critical value. They are a high index (nearly zonal) equilibrium, a low index (strongly meandering) equilibrium, and an intermediate equilibrium. The intermediate equilibrium is orographically unstable, that is, unstable due to a positive feedback on the mean zonal flow through the eddy heat flux associated with the orographically forced stationary waves. All three equilibria are baroclinically unstable unless the thermal forcing is very weak. The existence of the resonance of stationary baroclinic waves with the topography for a given mean zonal flow is responsible for the multiple equilibria.
Dissert. Abstr.

N83-14787 Rutgers - The State Univ., New Brunswick, N. J.
A TWO-DIMENSIONAL MODEL FOR TURBULENT FLOW IN THE UPPER ATMOSPHERE Ph.D. Thesis
Enrico Sciubba 1982 114 p
Avail: Univ. Microfilms Order No. DA8221705

A second order closure model for the atmospheric, two dimensional, steady, turbulent flow in a 'zonal channel' for the beta plane is developed, and the non-linear system of equations for the model is solved using a standard iterative technique. An important feature of this model is that it attempts to simulate thermal effects in the energy and enstrophy budgets by the introduction of a (fictitious) 'buoyancy' -like forcing term, which corresponds to a 'baroclinic' force field of intensity acting southwards in the beta. From the original governing equations a full set of relations for the Reynolds stresses is developed in addition to one equation for the mean momentum and one for the energy-balance. Dissert. Abstr.

N83-14788# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Geophysical Sciences Branch.
SEISMIC SITE CHARACTERIZATION TECHNIQUES APPLIED TO THE NATO RSG-11 TEST SITE IN MUENSTER NORD, FEDERAL REPUBLIC OF GERMANY
Donald G. Albert Jul. 1982 40 p refs
(DA Proj. 4A7-62730-AT-42)
(AD-A119390; CRREL-82-17) Avail: NTIS HC A03/MF A01 CSCL 08/11

Seismic P and SH wave refraction experiments at the NATO RSG-11 test site in Muenster Nord, Federal Republic of Germany, reveal the presence of a nearly horizontal, three-layer velocity structure. The upper layer, composed of unconsolidated glacial till, is 1 m thick and has P (compressional) and SH (shear-horizontal) wave velocities of 240 and 165 m/s. The second layer, made up of similar, more compacted material, is 9.5 m thick, with a P wave velocity of 470 m/s and an SH wave velocity of 275 m/s. The third layer, interpreted as the groundwater table, is located at

a depth of 10.5 m and has a P wave velocity of 1590 m/s. The SH wave velocity of this layer is controlled by the matrix material and is the same as that of the second layer. A single, unreversed observation indicated a fourth layer at a depth of about 20 m, but the existence of this layer remains unconfirmed. The observed fundamental mode Love wave dispersion is in agreement with the theoretical dispersion predicted by the refraction velocities. Computed partial derivaties of phase velocity with respect to shear wave velocity show, for the frequencies observed, that the dispersion confirms the thicknesses and velocities of the two upper layers and is not affected by the deeper structure. Author (GRA)

N83-14789# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN ANALYSIS OF SOLAR RADIATION DATA FOR FORT COLLINS, COLORADO M.S. Thesis - Colorado State Univ.
John Robert Conley May 1982 50 p refs
(AD-A119005; AFIT/CI/NR/82-30T) Avail: NTIS HC A03/MF A01 CSCL 04/1

Work with solar radiation reaching the earth's surface frequently requires a knowledge of the extraterrestrial solar radiation. A method of calculating extraterrestrial solar radiation over various time scales (i.e. instantaneous, hourly, daily, etc.) with known errors is detailed. Solar radiation data for Fort Collins, Colorado, for the years 1977-1980 are examined to determine extended periods of low surface solar radiation. During the 58 days from 5 January to 5 March 1978 the normalized direct component is shown to have been less than 0.15 for three separate periods totaling 29 days. From this same data set correlation equations between the hemispheric/extraterrestrial ratios are developed, allowing prediction of the diffuse component, given the hemispheric, for this high altitude, dry environment. Author (GRA)

N83-14790# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
ENGINEERING AND GEOLOGIC INVESTIGATION OF POTENTIAL SOURCES OF AGGREGATE, FORT IRWIN, CALIFORNIA Final Report, Jul. - Aug. 1981
Steve L. Webster and Lawson M. Smith Aug. 1982 79 p refs
(AD-A118994; WES/MP/GL-82-9) Avail: NTIS HC A05/MF A01 CSCL 13/3

Planned construction at Fort Irwin for the National Training Center consists of a number of buildings, roads, parking areas, and other structures in the cantonment area, an airfield with structures and aprons, and a railroad spur. The total amount of bituminous and concrete aggregates required for the construction ranges between 200,000 and 300,000 tons. This investigation was conducted to determine if adequate quantities of good quality fine aggregate and coarse aggregate could be excavated at a reasonable cost from two designated locations. This report describes the geology of the aggregate sources and presents the results of the field explorations and laboratory testing program. The sites investigated were found to contain adequate quantities of good quality fine and coarse aggregates suitable for use in the planned construction activities at Fort Irwin. Select borrow material from both sites is suitable for use as subgrade and subbase course. Crushed material from the coarse aggregate site is suitable for use as a stabilized aggregate base with a design CBR 80. The crushed coarse aggregate material is suitable for use in bituminous concrete; however, stripping is a problem and an antistripping agent will be required. Good quality portland cement concrete can be produced using aggregates from the two sites. However, since the aggregates are potentially reactive in the alkali-silica reaction, it is recommended that low-alkali portland cement be required in the concrete. GRA

N83-14791# Hawaii Inst. of Geophysics, Honolulu.
SPECTRAL ANALYSES OF HIGH-FREQUENCY Pn/Sn PHASES FROM VERY SHALLOW FOCUS EARTHQUAKES Technical Report, 3 Mar. 1981 - 2 Mar. 1982
Daniel A. Walker May 1982 56 p refs
(Contract F49620-81-C-0065; AF Proj. 2309)
(AD-A119180; AFOSR-82-0724TR) Avail: NTIS HC A04/MF A01 CSCL 08/11

Total rebuilding of the recording system, rather than planned improvements merely in the filter amplifiers, was necessitated by flooding of the station as a result of typhoon Freda in March of 1981. Improvements included quieter amplifiers greater fidelity produced by improved speed control on the tape drive motors, and an increased dynamic range. The rebuilt system was installed in July of 1981. Since that time numerous seismic phases have been recorded, many being high-frequency Pn/Sn and some being the normal, mantle-refracted P from earthquakes and explosions. A major software advancement was the development of a program that would determine the mean composite spectrum and standard deviations from a number of individual spectrums. No evidence was found for the normal, mantle-refracted P phases at their predicted arrival times within the Pn codes of events at distances of less than 21 degrees, further emphasizing the importance of high-frequency Pn phases in monitoring earthquakes or explosions in an oceanic environment. The levels of noise on the deep ocean bottom were found to be comparable to those found at the quietest continental sites. Explosions were found to have less energy at frequencies below 1.5 Hz and more energy at frequencies above 2 Hz than shallow focus earthquakes of comparable epicentral distance and magnitude. GRA

N83-14792# Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.
A METHOD TO CORRELATE THE UPPER AIR DENSITY WITH SURFACE DENSITY AND ESTIMATE THE BALLISTIC DENSITY FOR AIR OR SURFACE LAUNCHED MISSILES Final Report
Loren J. McAnelly Jul. 1982 118 p refs
(SF32391694; SF32399694)
(AD-A119496; NSWC/TR-82-81) Avail: NTIS HC A06/MF A01 CSCL 04/1

Atmospheric data collected twice daily from five ocean stations over a period of 7 years were used in a study to correlate ballistic densities at various levels. The study indicates that a good correlation does exist and that tables, nomograms, or data in a suitable format should be produced for use with new and existing fire control computers and range tables prepared for the Fleet. Two exponential functions of altitude were used to express the density-one from surface to 36,000 ft, the other from 36,000 to 65,000 ft. The coefficients were selected in a manner that produces a continuous function from sea level to 65,000 ft. The coefficients of the two functions were determined using a nonlinear least-squares technique. Fluctuations in the density profiles below 5,000 ft altitude were noted and were investigated by fitting a sample of temperature and pressure data with a least-square technique. Ballistic densities for firing at surface targets were computed for altitudes to 50,000 ft. While the current projectiles in the Fleet may not reach an altitude of 50,000 ft., this may become a reality in the near future. The procedure presented in this report could very easily be modified to compute ballistic density when firing at air targets at altitudes up to 50,000 ft. Author (GRA)

N83-14793# RAND Corp., Santa Monica, Calif.
CONFLICT AMONG TESTING PROCEDURES
Daniel F. Kohler Apr. 1982 57 p refs
(AD-A119475; RAND/P-6765) Avail: NTIS HC A02/MF A01 CSCL 08/14

The relationship among the Lagrange Multiplier Test (LM) the Wald test (W), and the Likelihood Ratio Test (LR) is reviewed. The inequality relation is also reviewed. Criteria are derived to determine which test is more appropriate in a given situation.
Author

N83-14794# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE MASS AND ANGULAR MOMENTUM BALANCE OF THE ZONALLY-AVERAGED GLOBAL CIRCULATION M.S. Thesis
Ronald D. Townsend and Donald R. Johnson 1981 52 p refs
(AD-A119758; AFIT/CI/NR-81-34T) Avail: NTIS HC A04/MF A01 CSCL 04/1

In this paper diagnostics of the zonally-averaged global circulation in both isobaric and isentropic coordinates are presented. Although diagnostics for the entire FGGE year have been

computed, only the results for January, April, July and October will be shown. The discussion focuses primarily on January or the Northern Hemisphere winter circulation. After a brief discussion of the data processing procedures the isobaric and isentroptic mass circulations are compared. The meridional distribution of zonally-averaged diabatic heating is calculated indirectly from the isentropic meridional mass circulation. In the final portion of the results diagnostics of relative angular momentum transport in isobaric and isentropic coordinates are contrasted and the forcing of mean meridional circulations is briefly discussed. Author (GRA)

N83-14795# Global Geochemistry Corp., Canoga Park, Calif.
GEOCHEMICAL STUDIES OF CORES FROM THE SAN JUAN BASIN RESEARCH SITE, GRANTS URANIUM REGION, NEW MEXICO Final Report
R. Haddad, I. Kaplan, d. Carlisle, K. deLancey (California Univ., Irvine), and V. P. Guinn (California Univ., Irvine) Sep. 1981 255 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-004153; GJBX-312-81) Avail: NTIS HC A12/MF A01

A geochemical study performed in the southern part of the Grants Uranium Region is described. Five hundred samples were analyzed for a suite of 23 trace and minor elements. One hundred samples were analyzed for (13)C/(12)C and (18)O/(16)O on carbonates, (13)C/(12)C on organic matter, (34)S/(32)S on sulfur, total sulfur and total organic and inorganic carbon. A detailed study was performed on carbonaceous material by separating the kerogen and extracting the bituminous material. From the study, it was inferred that the deposit is a modified primary or trend deposit altered by solutions. The evidence is based upon the following parameters: (1) there is no correlation between the carbon and uranium contents and the content of carbonaceous material is generally uniform between 0.05 to 0.10%; (2) sulfur isotope ratios of pyrite associated with uranium mineralization from a bimodal distribution. DOE

N83-14796# Civil Systems, Inc., San Leandro, Calif.
SPECIFICATION OF INPUT MOTIONS FOR SEISMIC ANALYSES OF SOIL-STRUCTURE SYSTEMS WITHIN A NONLINEAR ANALYSES FRAMEWORK Final Report
Y. Moriwaki, R. Pyke, M. Bastick, and T. Udaka Oct. 1981 140 p refs Sponsored by EPRI
(EPRI Proj. 810-9)
(DE82-901317; EPRI-NP-2097) Avail: NTIS HC A07/MF A01

A brief assessment of some rational approaches to specifying input motions within a nonlinear analysis framework is presented. Using a modified STEALTH 1D seismic and SHAKE computer codes, some points discussed in the assessment are illustrated. The cases studied in this project are confined to seismic environments with the wave field to consist of vertically propagating body waves, and the site to be horizontally layered. Under this seismic condition, it is possible to specify the control motion either (1) at an outcrop of the baserock, or a given soil layer at some depth, or (2) at the surface of the site profiled. DOE

N83-14797# Los Alamos Scientific Lab., N. Mex.
TECTONICS OF WEST CENTRAL MEXICO AND ADJACENT ARIZONA: A REMOTE SENSING AND FIELD STUDY IN ARID AND SEMI-ARID AREAS
W. S. Baldridge, Y. Bartov, and A. Kron 1981 8 p refs Presented at the Intern. Symp. on Remote Sensing on Environ., Cairo, Nov. 1981
(Contract W-7405-eng-36)
(DE82-002393; LA-UR-81-2920; CONF-811133-1) Avail: NTIS HC A02/MF A01

Large scale fault zones in west central New Mexico and eastern Arizona were mapped using conventional fieldwork aided by LANDSAT and SEASAT images and high altitude air photos. These faults, which are of post early Miocene age, trend NE-SW and N-S and extend over 200 km. The fault zones bound very large horst and graben blocks which, although located on the physiographic Colorado Plateau, are characteristic of Basin and Range deformation. Their intersection was the locus of extensive Cenozoic volcanism. The procedure developed in this project permitted investigation of an area of about 1.8 x 10 to the 5th power of arid and semiarid land whose structures previously were poorly defined. DOE

N83-14798# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
SATELLITE MEASUREMENTS OF THE EARTH RADIATION BUDGET Report, Jul. 1981
Bonn Bundesministerium fuer Forschung und Technologie Jul. 1982 170 p refs Symp. held in Cologne, 10 Jul. 1981 Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-006; ISSN-0170-1339) Avail: NTIS HC A08/MF A01

An overview of the role of the radiation balance in the terrestrial heat budget, and of the derivation of reflected and emitted radiation, using satellite measurements, is presented. Various symposium topics include: (1) energetics of the general atmospheric circulation and the World Climate Research Program; (2) radiation balance and the variability of atmospheric and surface properties; (3) earlier experiments for the determination of the components of the Earth radiation budget; (4) spatial, angular and temporal measuring problems; (5) radiation budget parameters at the top of the atmosphere as derived from satellite measurements; (6) the conical scan radiometer; (7) the Earth Radiation Budget Satellite System of the United States; (8) radiation budgets in large scale atmospheric circulation models; (9) cloud climatologies and the International Satellite Cloud Climatology Project; and (10) determination of the radiation budget at the Earth surface from satellite data. For individual titles, see N83-14799 through N83-14808.

N83-14799# Cologne Univ. (West Germany).
ENERGETICS OF THE GENERAL ATMOSPHERIC CIRCULATION AND THE WORLD CLIMATE RESEARCH PROGRAM (WCRP)
G. Metzig *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 13-25 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

Changes in atmospheric circulation caused by variations in the solar radiation balance were investigated. These variations generate heat transport modifications and may have an influence on local climate variations, e.g., seasonal climate variations. The modification of the Earth surface by deforestation or by devastation of agricultural land can also produce local climate variations and furthermore influence the water budget and the atmospheric carbon dioxide budget. This may lead to irreparable environmental damage. In the same way, one has to consider the anthropological input into the atmosphere. For climate research, it is necessary to monitor worldwide the radiation balance and its components. This includes registration of the solar constant. Precise information about the radiation budget are necessary in order to derive accurate data on the advective energy fluxes in the atmosphere-ocean system. Author (ESA)

N83-14800# Cologne Univ. (West Germany).
RADIATION BALANCE AND THE VARIABILITY OF ATMOSPHERIC AND SURFACE PROPERTIES
J. Schmetz *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 26-38 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

The variability in time and space of parameters relevant to the radiation balance of the Earth-atmosphere system is treated. There is a need for global observations of the local radiative properties of the atmosphere and their variability. Satellites provide a unique possibility to study globally the variability of meteorological fields. The data should be treated in a way that makes the variability of the observables more evident or relates them directly to dynamic processes. Meteorological fields derived from satellite measurements are already applied to verify the results of a several-day integration. Until now, comparisons between model-

produced cloud fields and satellite measurements give only marginal agreement. Author (ESA)

N83-14801# Cologne Univ. (West Germany).
EARLIER EXPERIMENTS (1959 - 1980) FOR THE DETERMINATION OF THE EARTH RADIATION BUDGET
M. Wiegner *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 39-54 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

Satellite measurements of the components of the radiation budget of the Earth-atmosphere system which indicate a lower planetary albedo and greater longwave excitation than previously assumed, are reviewed. The global annual net radiation flux seems to be nearly zero. Nevertheless, the results are still unsatisfying in respect of two problems. Firstly, there are not enough data, especially for the derivation of the exact anisotropy of reflected radiation over different kinds of scenes. It is important to develop scanning radiometers which provide complete angle sampling. Secondly, to measure diurnal variations of the components of the radiation budget and to improve the accuracy of the results, it is desirable to fly two or three satellites simultaneously. This is the only possibility to gain optimal data coverage in time and space. Author (ESA)

N83-14802# Cologne Univ. (West Germany).
SPATIAL, ANGULAR AND TEMPORAL MEASURING PROBLEMS
H. J. Preuss, W. Behnke, and M. Daniel *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 55-81 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

Spatial, angular and temporal measurements of meteorological parameters are treated. These measurements aim at describing the great variability of the atmospheric state. The temporal sampling errors of the radiation sums have different values for the 10 considered areas due to the different variability of cloudiness and also to the variability of reflected solar radiation and global radiation. One sample per day may be sufficient for the areas located in the subtropical belt of high pressure; up to 7 to 8 samples per day are needed in areas with thermal convection in the afternoon. Author (ESA)

N83-14803# Cologne Univ. (West Germany).
RADIATION BUDGET PARAMETERS AT THE TOP OF THE ATMOSPHERE AS DERIVED FROM SATELLITE MEASUREMENTS
M. Gube *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 82-98 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

Usefulness and errors of radiation budget estimates of spectral data from satellites, carrying narrow band radiometers, are demonstrated. Spectral radiance measurements can provide valuable estimates of the planetary radiation fluxes if certain points are taken into account. Firstly, the outgoing longwave flux density depends both on the temperature of the underlying surface (ground or cloud) and on the water vapor (WV) content of the atmosphere above. Sufficient information about these two parameters is contained in just two channels, a window channel and a 6.3 micro m WV channel. Corrections for zenith angle dependence can be applied easily by the help of model calculations. Secondly, the reflected shortwave flux can be calculated from spectral measurement in the visible region, although these spectral values do not provide information about water vapor absorption of solar radiation. This error, however, is probably negligible if compared to other errors inherent in the measurements themselves and in model calculations. Author (ESA)

N83-14804# Cologne Univ. (West Germany).
THE CONICAL SCAN RADIOMETER
T. Prosch and D. Hennings *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 99-112 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

A satellite-borne conical scan radiometer (CSR) is proposed, offering multiangular and multispectral measurements of Earth radiation fields, including the total radiances, which are not available from conventional radiometers. Advantages of the CSR for meteorological studies are discussed. In comparison to conventional cross track scanning instruments, the CSR is unique with respect to the selected picture element size which is kept constant by means of a specially shaped detector matrix at all scan angles. The conical scan mode offers the chance to improve angular sampling. Angular sampling gaps of previous satellite-borne radiometers can be interpolated and complemented by CSR data. Radiances are measured through 10 radiometric channels which are selected to study cloudiness, water vapor, ozone, surface albedo, ground and mean stratospheric temperature, and aerosols. Author (ESA)

N83-14805# Cologne Univ. (West Germany).
THE EARTH RADIATION BUDGET SATELLITE SYSTEM (ERBSS) OF THE UNITED STATES
E. Raschke *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 113-119 (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

A plan is presented which is accepted in the US to measure the radiation budget parameters simultaneously with wide field of view medium field of view and a scanning narrow field of view radiometer. The instrument parameters are summarized. Spectral and technical details are given. These instruments are planned to be flown in operational satellites of the NOAA series. A smaller low inclination satellite of the Atmospheric Explorer series can give valuable information sampled over tropical and subtropical regions of the Earth. The contributions of the different ERBSS members are grouped in four categories: modeling of instrumental performance; algorithms for data inversions; averaging of data in space and time; and consideration of the major aspects of most operational data evaluations and distributions to interested data users. Author (ESA)

N83-14806# Cologne Univ. (West Germany).
RADIATION BUDGETS IN LARGE SCALE ATMOSPHERIC CIRCULATION MODELS
A. Hense *In its* Satellite Meas. in the Earth Radiation Budget Jul. 1982 p 120-140 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

Results are presented from calculation with an operational model of radiation budgets and are compared with satellite observations. For the radiation balance of the Earth-atmosphere system, calculations and observations of global averages are very similar. For the radiation balance of the Earth surface, results obtained with general circulation models agree with real observations. For the radiation budget in the atmosphere, verifying model results with measurements is very difficult, if not impossible; more information on the vertical variation of the radiative transfer properties of the atmospheric column must be known. Author (ESA)

N83-14807# Cologne Univ. (West Germany).
CLOUD CLIMATOLOGIES AND THE INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP)
C. Simmer *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 141-155 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

The task of the ISCCP is described. The lack of sufficiently accurate global cloud climatologies which serve to check the models or provide input data, led to the foundation of the ISCCP. The goal is the development of a global cloud climatology based on observations at ground and by satellites. The task of the ISCCP is not only controlling and collecting the large data streams coming from the different participating countries, but also compressing the data into an appropriate form and thus deriving cloud and

radiation parameters to build up a global cloud climatology. A lot of work was done on cloud parameter determination from satellite data, and investigations were carried out to reduce the huge data sets to workable sizes. Author (ESA)

N83-14808# Cologne Univ. (West Germany).
DETERMINATION OF THE RADIATION BUDGET AT THE EARTH'S SURFACE FROM SATELLITE DATA
W. Moeser *In its* Satellite Meas. of the Earth Radiation Budget Jul. 1982 p 156-170 refs (For primary document see N83-14798 05-46)
Avail: NTIS HC A08/MF A01

The determination of the global Earth surface radiation budget and of the surface albedo is presented. The problem of determining the solar part of the radiation balance equation, especially the global radiation, was solved in various studies because of its interdisciplinary relevance not only for meteorology, but also for agriculture and solar energy purposes. The results show that the errors can be kept on the order of about 10% to 15% for hourly values, but high accuracy is obtained for longer time intervals. The problem of a proper comparison method between the two different measuring geometries (surface measurement - satellite measurement) remains. Surface albedos are to be derived from satellite images except for mountainous and inhomogeneous landscapes because of the various effects of shadowing which can hardly be simulated by radiative transfer theory. Author (ESA)

N83-14809# Research Inst. of National Defence, Stockholm (Sweden).
COMMON DATA EXPERIMENT: LONG PERIOD SURFACE WAVE SIGNALS
Peder Johansson Aug. 1982 34 p refs
(FOA-C-20462-T1) Avail: NTIS HC A03/MF A01

Results of the analysis of continuous long-period signals from 23 stations (93 seismometers) all over the world are presented. Of the 162 events, defined in the short-period analysis, 114 (70 %) were assigned a surface wave magnitude (Ms). In addition Ms was determined for 27 events in USGS Preliminary Determination of Epicenters list. The surface waves were also used to define events in cases where the short-period station networks failed and 57 such events (long period events) are reported, mostly at ocean ridges. Author (ESA)

N83-14810# Research Inst. of National Defence, Stockholm (Sweden).
COMPUTATION AND COMPILATION OF SHORT PERIOD IDENTIFICATION DATA
Ingrid Nordstrand Aug. 1982 34 p refs
(FOA-C-20463-T1) Avail: NTIS HC A03/MF A01

Seismological data from about 60 globally distributed stations were collected. Results on calculations of short period identification parameters for specially selected sets of events are given. These parameters include wave form complexity and the third moment of frequency related to the spectral properties of a seismic signal. The analysis of the computed values shows that it is necessary to apply station corrections when compiling data for one event. Due to the limited amount of data, station corrections could not be computed. Author (ESA)

N83-14811# Research Inst. of National Defence, Stockholm (Sweden).
COMMON DATA BASE EXPERIMENT: COMPILATION OF WAVEFORM DATA
Gunnel Barkeby Aug. 1982 101 p refs
(FOA-C-20464-T1) Avail: NTIS HC A06/MF A01

A seismic waveform data base and its data management procedures are described. The decoding of digital tapes, the creation of a homogeneous data base from disparate input formats, the retrieval of specified signals and time periods from the total waveform data base, and computerized graphic manipulation of signals are discussed. Author (ESA)

N83-14812# Research Inst. of National Defence, Stockholm (Sweden).
DOCUMENTATION OF SSYS: A COMPUTER PROGRAM FOR INTERACTIVE SEISMIC RESEARCH
Tord Tengstrand Aug. 1982 65 p
(FOA-C-20465-T1) Avail: NTIS HC A04/MF A01

A user manual for a program system (SSYS) which enables seismic signals and spectra to be displayed interactively is presented. Methods and programs are described, and run time instructions are given. Parameter files and error codes are discussed. Author (ESA)

N83-14813# Research Inst. of National Defence, Stockholm (Sweden).
SKIPLT DOCUMENTATION: A SEISMIC SIGNAL PLOTTER COMPUTER PROGRAM Final Report [DOKUMENTATION AV SKIPLT DATORPROGRAM FOER PLOTTNING AV SEIEMISKA SIGNALER]
Tord Tengstrand Aug. 1982 72 p In SWEDISH
(FOA-C-20466-E4) Avail: NTIS HC A04/MF A01

A program for a PDP 11 minicomputer in the RSX-11M operating system and for a Versatek plotter, for reading, under continuous operation, magnetic tapes containing information on seismic signals and for writing down these signals for subsequent analysis is presented. It features automatic selection of the best channels and automatic correction of the signals. Author (ESA)

N83-14814# Kiruna Geophysical Inst. (Sweden).
ON THE DYNAMICS OF THE RING CURRENT
Bengt Hultgivst Aug. 1982 37 p refs Submitted for publication (KGI-Preprint-057; ISSN-0349-2656) Avail: NTIS HC A03/MF A01

Knowledge of the ring current population is summarized with emphasis on the lower energies. It is shown that in magnetic storms 0+ ions of < 17 keV energy may contribute considerably to the energy density of the ring current in the entire altitude range. They may even dominate the dayside ring current in the early phase of such storms. It is argued that these 0+ ions observed in dayside magnetosphere are extracted directly out of the dayside ionosphere over a wide latitude interval. The likely importance for energy density of 0+ ions in the ring current above the energy limit investigated with regard to composition is discussed on the basis of Prognoz 7 observations of 0+ ions in the plasma mantle. Author (ESA)

N83-14815# Engins Matra, Velizy (France).
VARIATIONS IN THE CONDUCTIVITY OF AIR [VARIATION DE LA CONDUCTIBILITE DE L'AIR]
M. Frissard 15 Dec. 1982 11 p refs In FRENCH
(FIT-852) Avail: NTIS HC A02/MF A01

Formulas giving the air thermal conductivity are compared to experimental data. The thermal air conductivity obtained as a function of the air temperature in the temperature interval from -184 C to 649 C from four empirical formulas are compared to experimental data from MacAdams. It is found that when linearization is not required the formula lambda a - 0.000006152 X sq root Ta/1 +(207.535/Ta) where lambda a = thermal conductivity of air and Ta = absolute temperature of air in deg K gives results close to the experimental values. Author (ESA)

N83-14324*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DETERMINATION OF INTERCONTINENTAL BASELINES AND EARTH ORIENTATION USING VLBI
O. J. Sovers, J. L. Fanselow, G. H. Purcell, Jr., D. H. Rogstad, and J. B. Thomas *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 1-7 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 08G

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N83-14816 Virginia Univ., Charlottesville.
WIND POWER ASSESSMENT ALONG THE ATLANTIC AND GULF COASTS OF THE UNITED STATES Ph.D. Thesis
Joseph William Snow 1981 260 p
Avail: Univ. Microfilms Order No. DA8219076

A methodology is developed for producing detailed wind power surveys. It is applied in areas of the U.S. Atlantic and Gulf coastal zones. The initial steps in estimating the amount and areal distribution of wind power are climatological. A numerical model of the atmosphere which treats explicitly the physical processes occuring with the boundary layer is conditioned to represent the geophysical aspects of the designated area. Five wind regimes are identified, using essentially the classical mid-latitude cyclone concept, and, by region, the length of each wind season is determined along with the composition of each season in terms of the frequency of occurrence of each regime. The three season-regime situations occuring most frequently are identified and typical cases of each are selected from meterological records. Dissert. Abstr.

N83-14817 Saint Louis Univ., Mo.
A THREE-DIMENSIONAL TRAJECTORY STUDY WITHIN AND AROUND A SUPERCELL THUNDERSTORM MODEL Ph.D. Thesis
Tai-Chi Chen Wang 1981 161 p
Avail: Univ. Microfilms Order No. DA8223746

Some aspects of storm-environment interaction in the strongly sheared and veered environment are studied based on the three-dimensional dynamic trajectory calculation of air parcels. The computational domain has a volume of 20(km) x 20(km) x 14(km) covering the main updraft, the transition zone and the quasi-potential flow region of a model storm. Nearly 110 parcels were released uniformly over the western half of the domain at 3, 6 and 9 km level, respectively, with a constant distance of 2 km on each side. The dynamic trajectories were then computed using the Hamming's modified preditor-corrector method. The energetic characteristics of dynamic trajectories calculated are also investigated by examining the contribution of PPGF and thermal buoyancy to the kinetic energy change of a given air parcel. Further, the kinematic trajectories are calculated for the purpose of checking the physical consistency of the corresponding dynamic trajectories using the same launching positions and numerical method. Dissert. Abstr.

N83-14818 Wyoming Univ., Laramie.
AN OBSERVATIONAL STUDY OF THE ROLE OF CLOUD TOP ENTRAINMENT IN CUMULUS CLOUDS Ph.D. Thesis
Joey Francis Boatman 1981 291 p
Avail: Univ. Microfilms Order No. DA8220807

The role which cloud top plays in the entrainment process was studied. A better understanding of the internal adjustment of cumuli to entrainment was sought. An instrumented research aircraft was used to acquire thermodynamic, microphysical and dynamical data within and near cumulus clouds of the high plains and midwestern United States. More than 30 large cumulus clouds were examined. Temperature and liquid water content measurements made within the clouds were used to discover the source for any entrained air via a thermodynamic technique. These observations revealed that cloud top entrainment played a major role in diluting the clouds studied. As well, analysis of the sizes and habits of ice crystals observed within the evaporatively cooled downdrafts revealed their origin to be near cloud top. Evaporative cooling explained the magnitudes of the downrafts observed. Environmental air was observed to be forced downward 20-30 mb along the downwind edges of the clouds studied. A conceptual model is presented to explain the role of cloud top entrainment in producing the behavior observed. Dissert. Abstr.

N83-14819 Colorado Univ., Boulder.
MESOSCALE ENTRAINMENT INSTABILITY AS THE CAUSE OF MESOSCALE CELLULAR CONVECTION Ph.D. Thesis
Brian Howard Fiedler 1982 163 p
Avail: Univ. Microfilms Order No. DA8221073

The marine atmospheric boundary layer is often capped by a broken strato-cumulus cloud deck that is organized into a cellular or honeycomb pattern with the individual cells typically being 30 kilometers across. This phenomenon, known as mesoscale cellular convection, is advocated to be the result of a mesoscale entrainment instability in which mesoscale fluctuations in the mixed layer are generated by the modulaion of the entrainment of inversion air into the mixed layer. Buoyant mixed-layer air tends to rise into the inversion and to increase the stability of the entrainment interface between the mixed layer and the inversion. The mass entrainment rate is subsequently decreased above buoyant mixed-layer air and yet the entrainment of heat can increase since the buoyant mixed-layer air becomes adjacent to the warmer layers of the inversion. Unstable entrainment modes are shown to occur in which mesoscale buoyancy fluctuations are amplified in phase with water mixing ratio fluctuations if the potential temperature gradient in the inversion exceeds approximately 10 K km(-1). Dissert. Abstr.

N83-14820# World Meteorological Organization, Geneva (Switzerland).
INFORMATION ON METEOROLOGICAL SATELLITE PROGRAMS OPERATED BY MEMBERS AND ORGANIZATIONS
Aug. 1982 52 p
(WMO-411-Suppl-11) Avail: NTIS MF A01

Meteorological satellite programs in Japan, Europe, (METEOSAT), and the US are reviewed. N.W.

N83-14821*# Oregon State Univ., Corvallis. Dept. of Atmospheric Sciences.
THE DISTRIBUTION OF BAROCLINITY WITHIN THE ATMOSPHERE Final Report
D. A. Barber and M. Wai [1982] 32 p refs Original document was announced as N79-20638
(Contract NAS8-32694)
(NASA-CR-170678; NAS 1.26:170678) Avail: NTIS HC A03/MF A01 CSCL 04B

A three dimensional numerical interpolation scheme which resolves frontal gradients with fidelity was developed. The scheme is applied to the study of atmospheric upper baroclinic zones. J.M.S.

N83-14822*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
SHORT-TERM CLIMATIC FLUCTUATIONS FORCED BY THERMAL ANOMALIES
Adel Fahim Hanna Nov. 1982 229 p refs
(Contract DE-AS02-76EV-01340; Grants NAG5-136; NSF ATM-80-16867)
(NASA-CR-169685; NAS 1.26:169685; ISSN-0067-0340; ASP-360)
Avail: NTIS HC A11/MF A01 CSCL 04B

A two level, global, spectral model using pressure as a vertical coordinate was developed. The system of equations describing the model is nonlinear and quasi-geostrophic (linear balance). Static stability is variable in the model. A moisture budget is calculated in the lower layer only. Convective adjustment is used to avoid supercritical temperature lapse rates. The mechanical forcing of topography is introduced as a vertical velocity at the lower boundary. Solar forcing is specified assuming a daily mean zenith angle. The differential diabatic heating between land and sea is paramterized. On land and sea ice surfaces, a steady state thermal energy equation is solved to calculate the surface temperature. On the oceans, the sea surface temperature is specified as the climatological average for January. The model is used to simulate the January, February and March circulations. Author

N83-14823*# FWG Associates, Inc., Tullahoma, Tenn.
PRELIMINARY TEST RESULTS OF ELECTRICAL CHARGED PARTICLE GENERATOR FOR APPLICATION TO FOG DISPERSAL Final Report
Walter Frost Washington NASA Nov. 1982 45 p refs
(Contract NAS8-33541)
(NASA-CR-3654; NAS 1.26:3654) Avail: NTIS HC A03/MF A01 CSCL 04B

A charged particle generator for use in fog dispersal applications was built and preliminary tests were carried out. The parameter used as a measure of performance was the current measured with a needle probe positioned in the charged jet connected to ground through an ammeter. The needle was movable and allowed the current profile throughout the jet to be determined. The measured current is referred to as the current output. The major independent parameters were liquid water injection rate, plenum pressure, and corona voltage. Optimum current output was achieved at the approximate pressure of 30 psig, corona voltage of 5600 volts, and liquid water injection rate of 6 cc/min. The results of the test with the prototype charged particle generator clearly demonstrate that a current on the order of 20 microamperes can be routinely achieved with the system. This measurement of current does not necessarily represent the total issuing from the nozzle current which is expected to be larger. From these results, confidence was established that a charged particle generator which will operate continuously and consistently can be designed, constructed, and operated. Further work is required, however, to better understand the physical mechanisms involved and to optimize the system for fog dispersal application. Author

N83-14824*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A STABILITY ANALYSIS OF AVE-4 SEVERE WEATHER SOUNDINGS
Dale L. Johnson Nov. 1982 139 p refs
(NASA-TP-2045; NAS 1.60:2045) Avail: NTIS HC A07/MF A01 CSCL 04B

The stability and vertical structure of an average severe storm sounding, consisting of both thermodynamic and wind vertical profiles, were investigated to determine if they could be distinguished from an average lag sounding taken 3 to 6 hours prior to severe weather occurrence. The term average is defined here to indicate the arithmetic mean of a parameter, as a function of altitude, determined from a large number of available observations taken either close to severe weather occurrence, or else more than 3 hours before it occurs. The investigative computations were also done to help determine if a severe storm forecast or index could possibly be used or developed. These mean vertical profiles of thermodynamic and wind parameters as a function of severity of the weather, determined from manually digitized radar (MDR) categories are presented. Profile differences and stability index differences are presented along with the development of the Johnson Lag Index (JLI) which is determined entirely upon environmental vertical parameter differences between conditions 3 hours prior to severe weather, and severe weather itself. S.L.

N83-14825*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE CONCEPTION, GROWTH, ACCOMPLISHMENTS AND FUTURE OF METEOROLOGICAL SATELLITES
William W. Vaughan, comp. Washington Nov. 1982 105 p refs Proc. of the 62d Ann. Meeting held at San Antonio, Tex., 11-15 Jan. 1982; sponsored by the American Meteorological Society
(NASA-CP-2257; NAS 1.55:2257) Avail: NTIS HC A06/MF A01 CSCL 04B

Historical reviews and assessments of the current and projected role of meteorological satellites are presented. The TIROS, TIROS N, and Nimbus series satellites are discussed. For individual titles, see N83-14826 through N83-14833.

N83-14826*# National Center for Atmospheric Research, Boulder, Colo.
EARLY SATELLITE PROGRAM DEVELOPMENTS
William W. Kellogg *In* NASA. Marshall Space Flight Center The Conception, Growth, Accomplishments and Future of Meteorol. Satellites Nov. 1982 p 1-4 (For primary document see N83-14825 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

A historical overview of the pioneer projects for the development of meteorological satellites is given. In addition, the parallel development of the responsible space agencies and panels is addressed. The Vanguard 2 satellite, the first Earth radiation experiment, and the vidicon equipped TIROS-1 satellite are discussed. M.G.

N83-14827*# Capital Inst. of Tech., Kensington, Md.
EARLY PROGRAM DEVELOPMENT AND IMPLEMENTATION
Morris Tepper *In* NASA. Marshall Space Flight Center The Conception, Growth, Accomplishments and Future of Meteorol. Satellites Nov. 1982 p 5-33 (For primary document see N83-14825 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Programs for the development and operation of meteorological satellites from the TIROS 1 satellite and the establishment of NASA through the 1960's are described. The technical problems confronted in the development of the early satellite systems are discussed in addition to issues in international involvement and program support. The TIROS and Nimbus series satellites are primarily addressed. M.G.

N83-14828*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT OF THE OPERATIONAL PROGRAM FOR SATELLITE METEOROLOGY
David S. Johnson *In its* The Conception, Growth, Accomplishments and Future of Meteorol. Satellites Nov. 1982 p 34-40 (For primary document see N83-14825 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The geostationary and polar satellites comprising the current operational system are discussed. The data acquisition capabilities of both satellite types and their complementary functions are reviewed. The advanced very high resolution radiometer on the TIROS N satellites is particularly addressed along with the imaging and atmospheric sounding instrumentation aboard the GOES satellites. The dissemination of the satellite data to the prospective users is also discussed. M.G.

N83-14829*# Air Weather Service, Scott AFB, Ill.
MILITARY APPLICATIONS EVOLUTION AND FUTURE
Albert J. Kaehn, Jr. *In* NASA. Marshall Space Flight Center The Conception, Growth, Accomplishments and Future of Meteorol. Satellites Nov. 1982 p 41-47 (For primary document see N83-14825 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The Defense Meteorological Satellite Program is described with particular emphasis on the military applications of METSAT data. Satellite operational support, data processing and image quality requirements are discussed. M.G.

N83-14830*# National Science Foundation, Washington, D.C. Div. of Atmospheric Sciences.
KEY SCIENTIFIC QUESTIONS AND THE ROLE OF SATELLITES
Eugene W. Bierly *In* NASA. Marshall Space Flight Center The Conception, Growth, Accomplishments and Future of Meteorol. Satellites Nov. 1982 p 48-71 (For primary document see N83-14825 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Some of the research opportunities that are available from geostationary satellite data, especially from MONEX during the Global Weather Experiment are described. In addition, the International Cloud Climatology Program is described and the use of satellite imagery in studying mesoscale convection complexes is discussed. Finally, information derived from satellite data on ocean winds is examined. M.G.

N83-14831*# Colorado State Univ., Fort Collins.
COMMENTS ON SATELLITE METEOROLOGY FROM GEOSTATIONARY SATELLITES
Thomas VonderHaar *In* NASA. Marshall Space Flight Center The Conception, Growth, Accomplishments and Future of Meteorol. Satellites Nov. 1982 p 72-83 (For primary document see N83-14825 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Examples of the use of geostationary satellites in meteorology are given. Studies of the rate of change of cumulus clouds and cloud systems and wind parameter determination from cloud motions are reviewed. Computer processed imagery products are also discussed. M.G.

N83-14832*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROSPECTS FOR THE FUTURE
David Atlas *In* NASA. Marshall Space Flight Center The Conception, Growth, Accomplishments and Future of Meteorol. Satellites Nov. 1982 p 84-96 (For primary document see N83-14825 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Atmospheric and surface fields produced from the TIROS N high resolution infrared sounder/microwave sounding unit data are discussed. The data were analyzed by direct physical inversion of the multispectral radiative transfer equation. Sea ice mapping and sea surface temperature determination are addressed. M.G.

N83-14833*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REMARKS ON FUTURE DEVELOPMENTS
David S. Johnson *In its* The Conception, Growth, Accomplishments and Future of Meteorol. Satellites Nov. 1982 p 97-101 (For primary document see N83-14825 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Future developments in satellite meteorology are proposed and examined in the light of policy and funding changes. M.G.

N83-14834*# Illinois Univ., Urbana. Dept. of Atmospheric Sciences.
TROPICAL CYCLONE TRACK AND GENESIS FORECASTING USING SATELLITE MICROWAVE SOUNDER DATA Final Report
Stanley Q. Kidder Dec. 1982 50 p refs
(Grant NAG5-132)
Avail: NTIS HC A03/MF A01 CSCL 04B

Although many dynamical and statistical prediction schemes are available to forecasters, tropical cyclone track errors are still large. One primary difficulty is that tropical cyclones exist over the data-sparse tropical oceans. Satellite sounders, however, routinely provide numerous data over these areas. Mean layer temperatures from the Scanning Microwave Spectrometer on board the Nimbus 6 satellite are decomposed using empirical orthogonal functions, and the expansion coefficients are related to deviations from the persistence forecast location, to speed change, to direction change and to intensity change. The significance of the regression equations is tested by a null hypothesis of zero correlation coefficient. It appears that significant information about tropical cyclone motion exists in the satellite-estimated mean layer temperatures, especially at upper levels. A physical interpretation of the statistical results is offered, and a one-storm-out independent test is used to test the stability of the equations. Finally, some further work is suggested. Author

N83-14835*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NIMBUS 6 RANDOM ACCESS MEASUREMENT SYSTEM APPLICATIONS EXPERIMENTS
Charles E. Cote, ed., Ralph Taylor, ed., and Eugene Gilbert, ed. Oct. 1982 103 p
(NASA-SP-457; LC-82-14553) Avail: NTIS HC A06/MF A01 CSCL 04B

The advantages of a technique in which data collection platforms randomly transmit signal to a polar orbiting satellite, thus eliminating satellite interrogation are demonstrated in investigations of the atmosphere; oceanographic parameters; Arctic regions and ice conditions; navigation and position location; and data buoy development. For individual titles, see N83-14836 through N83-14862.

N83-14836*# National Center for Atmospheric Research, Boulder, Colo.
TROPICAL WIND, ENERGY CONVERSION AND REFERENCE LEVEL
In NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Jan. 1982 p 8-11 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The primary experiment flown on the Nimbus 6 satellite that used the random access measurement system payload capability was the tropical wind, energy conversion, and reference level experiment (TWERLE) in which 400 superpressure balloons launched in the tropics transmitted data on atmospheric temperature and pressure as well as gravity waves to the polar orbiting satellite which processed the signals and transmitted them to ground stations. The scientific objectives of TWERLE, the payloads and flight levels of the balloons, the coverage achieved by these data collection platforms, and the Southern Hemispheric polar stereographic 150-mb map used in the reference load portion of the experiment are discussed. A.R.H.

N83-14837*# Bureau of Meteorology, Melbourne (Australia). Dept. of Science.
AUSTRALIAN DRIFTING BUOY
H. N. Brann and D. E. Handcock *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 12-13 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The effectiveness of free floating buoys to support atmospheric modeling over the South Indian and Southern Pacific Oceans was investigated in an experiment conducted to: (1) measure air pressure and sea surface temperature from free drifting buoys in the South Indian Ocean; (2) use the data in the assessment of atmospheric modeling accuracy; and (3) study the practical and logistical problems in the deployment of free-floating buoys from ships of opportunity and to obtain information on buoy trajectories as a basis for planning buoy release points for continuous coverage of the South Indian and Southern Pacific Oceans between 60 deg and 150 deg east longitude. The position data from RAMS were of significant value in analysis but were usable for real-time operations because the data were not immediately available. The analysis showed that buoy data received within 6 h of real time would make significant improvement to real-time analyses in the Southern Hemisphere. A.R.H.

N83-14838*# Utah State Univ., Logan. Center for Research in Aeronomy.
STRATOSPHERIC MONITORING WITH LONG-TERM BALLOON FLIGHTS
P. Roger Williamson *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 14 refs (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Superpressure, long-term (up to 1 yr), balloon flights at a nearly constant altitude of 95,000 ft (15 mb) were employed to measure upper atmospheric chemistry. Long-duration flights permitted observations with a single group of instruments over a long period of time at a constant density altitude. Daily and seasonal variations were observable. The probability of observing effects from solar events and other sporadic geophysical events was greatly increased while at the same time quiet and disturbed conditions were compared with the same instrument at constant density altitude. Three balloon were launched from Christchurch, New Zealand in 1977. The data capability required 16 addresses for each of the balloons, giving 32 channels of 8 bits for a total of

256 bits of data every minute. For a typical satellite pass duration of 10 to 15 min, the total data capability was from 2500 to 300 bits per pass. Each pass occurred near local noon, giving a minimum of one data readout per day. The RAMS position location accuracy was 5 km. A.R.H.

N83-14839# National Ocean Survey, Rockville, Md. Atlantic Oceanographic and Meteorological Labs.
LAGRANGIAN SURFACE CURRENT
Donald V. Hansen *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 18-20 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Nimbus 6 RAMS-tracked drifting buoys lagrangian current data for assessment of probable trajectories of accidental oil spills in the Gulf of Alaska and the southeastern Bering Sea and were used as part of the North Pacific experiment test shuttle project to evaluate the utility of a meridional 'shuttle' between Hawaii and Tahiti as a preliminary effort to the design of a more ambitious shuttle operation in the tropical Pacific Ocean during the field work phase of FGGE. Fourteen buoys were deployed at the 150 deg W at various latitudes between 10 deg N and 10 deg S. Buoys launched by another experimenter north of 10 deg N latitude in North Equatorial Current (NEC) moved westward as expected, but with considerable eddying. Between 0 deg and about 10 deg N, buoys moved westward in the South Equatorial Current (SEC) and eastward in the North Equatorial Countercurrent (NECC) as expected, but in addition moved northward presumably with the near surface Eckman transport from the SEC into and through the NECC. This northward movement is in opposition to the meridional geostrophic flow. A.R.H.

N83-14840*# Texas A&M Univ., College Station. Dept. of Oceanography.
TRACKING THE KUROSHIO
A. D. Kirwan, Jr. *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 21-22 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Four drifters that drogued at 100 m by a 9.2-m personnel parachute were deployed off the island of Kyushu from the vessel Takuyo and tracked by the RAMS. The experiment goals were to: (1) compare the results of the drifter tracks and velocities with those obtained in other studies and in the hydrographic surveys; (2) verify the existence of the cold and warm water eddies; and (3) study the variability of the currents in the extension region. The agreement between the trajectories and the hydrographic surveys was excellent. The main features of the Kuroshio, such as path and velocity, were duplicated in both the drifter and survey data sets. The trajectories, however, failed to detect either the warm or cold core eddies associated with the meander. One significant result was the demonstration of a nearly real time data return capability provided by Nimbus 6. Position as well as environmental data were provided. A.R.H.

N83-14841*# Environment Canada, Victoria (British Columbia).
MESOSCALE OCEAN VARIABILITY
John Garrett *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 23 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The Nimbus 6 random access measuring system was used in a mesoscale ocean variability experiment conducted to determine the horizontal extent of oceanic variables influenced by individual storms. Ten drifting buoys were used to determine the horizontal variability of velocities and temperatures in the upper layer of the ocean, at scales of 100 to 500 km, in a region expected to be stormy during the period of the experiment. In addition, 30 prototype buoys of the type to be used during the first GARP global experiment were tested to determine buoy reliability. Measurements reported by the buoys were analyzed to review the sources of error or uncertainty in such pressure measurements. It is concluded that barometric pressure measurements can be made from small buoys with accuracies of about + or - 1 mb under typical conditions. To achieve uncertainties less than 2.0 mb under extreme conditions, it is probably necessary to average the transducer signal over several wave periods. A.R.H.

N83-14842*# Coast Guard, Washington, D.C. Oceanographic Unit.
LAGRANGIAN DRIFT MEASUREMENTS OF SEA SURFACE CURRENTS AND ICEBERG TRACKING
E. A. Delaney and K. M. Palfrey *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access System Appl. Expt. (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Drogued buoys were tracked by the Nimbus 6 random access measuring system for approximately 10 days in the U.S. East Coast Continental Shelf waters between Delaware Bay and Cape Hatteras in February 1976. The resulting drift values were used to check a numerical model developed at the U.S. Coast Guard Oceanographic Unit for predicting surface currents on the Continental Shelf. Similar buoys were also tracked on the Grand Banks of Newfoundland for the U.S. Coast Guard's International Ice Patrol. Lagrangian drift velocities were measured in or near the Labrador Current. Prediction numerical models that were then in use or proposed for use by the Commander, International Ice Patrol, who has the operational responsibility for warning. Following field studies in the area of the Ice Patrol, the lagrangian drift velocities gleaned from the Nimbus 6 RAMS were used to test a numerical model of time-dependent Ekman wind generated currents. Air droppable RAMS buoys deployed from C-130 aircraft were also deployed onto icebergs that break off from Greenland glaciers and drift into the North Atlantic shipping lanes. A.R.H.

N83-14843*# Commonwealth Scientific and Industrial Research Organization, Cronulla (Australia).
INDIAN OCEAN AND TASMAN SEA
George Cresswell *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 27-31 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Two experiments were developed to study ocean circulation patterns. Drifting buoys tracked by the Nimbus 6 RAMS were used to increase knowledge of the currents of the eastern Indian Ocean and thereby gain some insight into the migration of the planktonic larvae of the commercially important rock lobster. The question under study was whether the ocean circulation provides a migration circuit for the larvae or is this a matter of chance. In another experiment, buoys were used to track Gulf Stream rings, which are approximately 100-mile-diameter cyclonic vortices shed by meanders of the Gulf Stream. For this experiment serveral rings were tagged with Nimbus 6 RAMS satellite trackable Continental Shelf RAMS (COSRAMS) buoys to follow the rings remotely for as long as possible. Another purpose for tracking the rings was to provide ground truth data for the SEASAT 1 radar altimeter. B.W.

N83-14844*# Woods Hole Oceanographic Institution, Mass.
A STUDY OF THE GULF STREAM USING SATELLITE-TRACKED DROGUED SURFACE BUOYS
Phillip L. Richardson IN NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 32-34 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

A Gulf Stream experiment and a Gulf Stream ring experiment, were performed by the Woods Hole Oceanographic Institution. The ring experiment was designed to measure the movement of rings in the Sargasso Sea to learn where rings go, what their eventual fate is, and what influences their motion. Measurements were made of the physical, chemical, and biological characteristics of the rings and their changes with time. The purpose of the Gulf Stream experiment was to investigate the general problem of where the Gulf Stream flows and how it disperses and recirculates after passing the Grand Banks of Newfoundland. To help resolve the near-surface flow pattern of the Gulf Stream, several buoys were

launched in the Gulf Stream in 1977. In addition, many of the buoys originally launched in rings became entrained into the Gulf Stream as the rings coalesced; these buoys provided many trajectories in the Gulf Stream. B.W.

N83-14845*# Norwegian Meteorological Inst., Blindern.
THE RAMS COLLECTION OF METEROLOGICAL AND POSITION DATA IN THE NORWEGIAN SEA
Jack Nordo and Carl Kolderup Jensen *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 35-36 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

The Norwegian Meteorological Institute developed an experiment using the Nimbus 6 RAMS to obtain meteorological data from remote areas of the Norwegian Sea and to determine the flow of ice in the Arctic Ocean. The purpose of the ice drift investigations were as follows: (1) To obtain ice drift speeds in the Svalbard-Greenland area and compare them with meteorological and oceanographical conditions. The results will be used to develop forecast rules (short range for sea ice movements). (2) To use ice drift speeds to determine the outflow of sea ice from the Arctic Basin and from the eastern part of the Svalbard Archipelago to verify numerical models for ice circulation in the Arctic Basin. (3) To study the tidal influence upon the ice drift and obtain average speed of sea surface currents. This information was used to aid fishing, shipping, and oil drilling operations. B.W.

N83-14846*# Ministry of Agriculture, Fisheries and Food, Lowestoft (England).
UNITED KINGDOM DRIFTING BUOY PROJECT
Robert R. Dickson and H. W. Hill *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 37-38 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Three sets of experiments employing drifting buoys in the North Atlantic that were tracked by a Nimbus satellite are described. Deep water circulation in the Norwegian sea was studied with the view of investigating the possibility that a south going deep flow exists along the slope from Spitsbergen to southern Norway. the North Atlantic deep drift experiments were designed to investigate the basic oceanography ice region were the drift divides into three branches. Wave and surface drift experiments were designed to provide wave data and to investigate correlation between wave and surface current conditions. R.J.F.

N83-14847*# Research Triangle Inst., Research Triangle Park, N.C.
WESTERN BOUNDARY EDDIES OF THE GULF STREAM
Fred V. Vukovich *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 39-40 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Oceanic exchange processes between the water on the Continental Shelf and the Gulf Stream of the Southeast coast of the United States are discussed. Eddies on the western boundary of the Gulf Stream were observed using infrared imagery. It was shown that barotropic waves that interact with the current shear of the Gulf Stream will become unstable and propagate downstream along the shelf. Real-time temperature, depth, and salinity data were collected. The experiments revealed that a class of Gulf Stream western boundary eddies developed immediately downstream (within 100 km) from an along shore topographical feature called the Charleston Bump. The data indicated cyclonic motion associated with the western boundary eddies from the surface to about 300 m. R.J.F.

N83-14848*# Texas A&M Univ., College Station. Dept. of Oceanography.
DRIFT BUOY COMPONENT, NORPAX ANOMALY DYNAMICS STUDY
A. D. Kirwan, Jr. *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 42-44 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Drifting buoys were used to map large-scale circulation in the North Pacific Ocean for an anomaly dynamics study. Large-scale response of the general circulation of the North Pacific to autumn and winter storm activity was studied to predict the formation and evolution of large-scale thermal anomalies. The temperature/time series for all the drifters showed the diurnal heating cycles as well as the long-term seasonal march from early summer through fall. Preliminary data showed wavelike features along with a number of eddy mesoscale structures. R.J.F.

N83-14849*# Raytheon Co., Portsmouth, R. I.
NEW ENGLAND OUTER CONTINENTAL SHELF PHYSICAL OCEANOGRAPHY PROGRAM **c48**
Ronald A. Franklin *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 45 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

Drogued buoys deployed on Georges Bank and tracked by satellite provided comprehensive data on the seasonal current patterns. Evidence for a clockwise gyre circulation was obtained for the spring and summer seasons. Buoys were fitted with 10-m-long canvas window shade drogues centered at a depth of 11 m. Positions accurate to a few kilometers were obtained approximately every second day by the Nimbus 6 satellite. Lagrangian data collection was divided into four discrete experiments, each incorporating 4 to 6 buoys and lasting 8 to 10 weeks. Smoothed buoy tracks were prepared from these experiments. N.W.

N83-14850# National Ocean Survey, Rockville, Md. Atlantic Oceanographic and Meteorological Labs.
SURFACE CURRENTS IN THE CARRIBEAN SEA **c48**
Donald V. Hansen *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 46-48 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08C

An experiment was conducted in the Caribbean Sea to map the distribution of surface currents. Lagrangian-drifter buoys tracked by satellite were deployed in the passages of the Lesser Antilles and within the Caribbean Sea. The buoy trajectories were considerably more complex than merely a westward drift, with several scales of meanders and eddies observed. The residence time in the Caribbean Sea for some of these buoys was more than 5 months. Nineteen drifters were deployed in the eastern Caribbean Sea in two separate deployments. All the position data were edited in an automated computer routine and have a root mean square error of about 5 km. On the average, one to two positions were available per day after the editing. Results from the data indicate that the flow in the Caribbean Sea is predominantly in the west at speeds of 50 to 75 cm/s. N.W.

N83-14851*# Alaska Dept. of Fish and Game, Fairbanks.
SATELLITE RADIO TRACKING OF POLAR BEARS **c51**
Jack W. Lentfer and Douglas DeMaster (Minnesota Univ., Minneapolis) *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 52-53 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 06C

The entire transmitter package weighed under 5 kg, making it smaller and lower in power than other Nimbus 6 transmitters. The design also included a loose-fitting, urethane neck collar design that would withstand the bear's abuse. The upper section of the collar contained the antenna, which would radiate a hemispherical pattern. A lexan box was used for the satellite communications electronics. The lower section of the collar (under the bear's neck) contained an 11-V lithium battery pack. In expanding the project, 11 bears, divided into three groups, were fitted with transmission collars and released at various points throughout Alaska, Canada, and Greenland. N.W.

N83-14852*# National Museum of Natural History, Paris (France).
ICEBERG TRACKING IN THE ANTARCTIC c48
P. Tchernia *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 54-55 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08L

Five radiobeacon packages were built. Two supply vessels serving deployed the radiobeacons on random icebergs. It was recommended that the five radiobeacons be placed in the general region between 80 deg and 110 deg E latitude. Five different trackings showed a U-turn movement or recurvature between 62 deg and 64 deg S linking the east-west juxtacontinental drift current that rules the Antarctic zonal circulation between about 62 deg and 38 deg S. These experiments and especially Nimbus 6 tracks 211 and 474 show that around 90 deg E, as in the Weddell Sea, there is a permanent interaction diversion connecting the two parallel and inverse currents. Author

N83-14853*# Polar Research Lab., Inc., Santa Barbara, Calif.
ARCTIC RESEARCH IN ENVIRONMENTAL ACOUSTICS c71
Beaumont M. Buck *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 56-57 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 20A

The causative relationships between ice dynamics and underwater acoustic relative levels and associated correlations with meteorological, geophysical, and oceanographic conditions were the subject of an experiment added to the planned arctic ice dynamics joint experiment project to measure simultaneously underwater acoustic noise levels, which are caused primarily by ice dynamics, with wind drag and ice movement so as to provide a better understanding of the causes and mechanisms of noise. A new buoy for unattended use in icebound seas called the synoptic random access measurement system was developed using the Nimbus 6 satellite for relaying data and position information. N.W.

N83-14854*# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Snow and Ice Branch.
ANTARCTIC SEA ICE DATA BUOYS c48
Stephen F. Ackley *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 58-59 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08C

The drift/strain relations in sea ice in the Weddell region and surface pressure and temperature in the Weddell Sea were studied. Six buoys, both airdrop and ship-deployment types, were distributed on the pack ice of the Weddell Sea in the austral summer period. The air droppable RAMS (ADRAMS) buoys transmitted data on location, pressure, and temperature to the Nimbus 6 satellite in a near-polar orbit. N.W.

N83-14855*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ICE FLOE TRACKING IN THE ARCTIC c48
William S. Dehm (Sea Ice Consultants, Camp Springs, Md.) *In its* Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 60 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08C

Three PRL ADRAMS buoys were deployed on sea ice floes in the arctic. The overall objective of the experiment was to determine the forces producing sea conditions that might impact on offshore structures in a specific locale close to the north coast of Alaska. The buoys were equipped with barometric pressure and air temperature sensors. N.W.

N83-14856*# Washington Univ., Seattle.
ARCTIC ICE DYNAMICS JOINT EXPERIMENT c48
Norbert Untersteiner *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 61 Translation was announced as N68-20861 Sponsored in part by National Science Foundation, the Navy, Canadian Polar Continental Shelf Project and National Oceanic and Atmospheric Administration (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08L

The interaction of sea ice with the environment was investigated by measuring the motion of sea ice, surface atmospheric pressure, air temperature, and the ocean currents beneath the sea ice in the Beaufort and Chukchi Seas and in the Bering Straits. The experiment employed three types of data buoys that use the Random Access Measuring System (RAMS) locating system. These buoys employed the first synoptic sampling and memory equipment to relay data through a polar-orbiting satellite. The advent of the data collection and tracking Nimbus 6 RAMS enabled development of a relatively simple and reliable platform at low cost. The RAMS buoy data were used to generate the barometric pressure field. From this field it is possible to predict the motion of sea ice using a mathematical model. The RAMS data were used further to test the validity of the model by comparing the predicted and the RAMS-measured motions. J.M.S.

N83-14857*# Norsk Polarinstitutt, Oslo.
ICE DRIFT EXPERIMENT IN THE SVALBARD-GREENLAND AREA c48
Torgny Vinje and Thor Haegh (Royal Norwegian Council for Scientific and Industrial Research, Oslo) *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 62-63 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08L

Ice drift speeds in the Svalbard-Greenland area were measured to help develop forecast rules for sea ice movements, to test numerical models for the ice circulation in the Arctic Basin, and to study the tidal influence upon the ice drift. Ice drift speed rates data may be used to estimate the outflow of ice from the Arctic Basin and thus serve as a control for the circulation models for the drift ice in the Arctic Ocean. Four buoys were constructed with RAMS transmitters for Nimbus 6 position location. Ice drift data were of interest both for drift conditions in this area and for future experiment planning. In the eastern part of the archipelago, buoys made large circular counter clockwise movements in highly concentrated drift ice during August and September. It is believed that this circulation was mostly wind driven, and is in opposite rotation to sea current circulation in this area. The RAMS position data were reliable and valuable for data collection in such remote and inaccessible areas. J.M.S.

N83-14858*# Chevron Oil Field Research Co., La Habra, Calif.
WEST GREENLAND ICEBERG DRIFT AND OCEAN CURRENT INVESTIGATIONS c48
Larry Brooks *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 64-65 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01

An experiment using the Nimbus 6 RAMS was conducted to obtain iceberg drift and ocean current data in the Davis Strait, off the coast of Greenland. This experiment was designed to determine the feasibility of mathematically modeling iceberg drift, and to investigate drift patterns that would affect possible oil spills. Initially, four buoys were deployed in the Davis Strait in the summer of 1976. Only RAMS position data were provided. In general, the drift patterns of the buoys confirm the current patterns reported in oceanographic atlases for the Davis Strait; i.e., a north-flowing West Greenland Current that branches to the west and joins the south-flowing Labrador Current. The lagrangian drift data are very unique and are believed to be the first such data for this area. When combined with the eulerian data collected by moored current meters, these data should enhance understanding of the complex Davis Strait sea current regime, particularly with respect to iceberg drift and oil spill migration. J.M.S.

N83-14859*# National Oceanic and Atmospheric Administration, Bay St. Louis, Miss. National Space Technology Lab.
SATELLITE-LINKED PORPOISE TRACKING SYSTEM c51
E. G. Woods and A. Kemmerer *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 70-71 (For primary document see N83-14835 05-47)

Avail: NTIS HC A06/MF A01 CSCL 06C

The feasibility of using a prototype satellite-linked tracking system to follow movements of wild dolphins was demonstrated. A small, lightweight transmitter pack that could be carried for several months by these sleek animals was developed based on the porpoise's form and behavior and the specifications of the Nimbus satellite system. The unit consists of two connected cylindrical aluminum tubes with the electronics contained in one side and the batteries in the other. Two wild Hawaiian spotted porpoises were instrumented with these prototypes and successfully tracked using the Nimbus 6 satellite for two and seven days. J.M.S.

N83-14860*# Baker (James L.) Development Corp., Sherwood Forest, Md.

DISTRESS COMMUNICATION AND LOCATION SYSTEM FOR SMALL CRAFT **c32**

James L. Baker *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 76-77 refs (For primary document see N83-14835 05-47)

Avail: NTIS HC A06/MF A01 CSCL 17B

An experiment was developed for use with the Nimbus 6 RAMS to determine the feasibility of satellite-aided search and rescue at sea. The experiment was conducted aboard the 32-ft sloop Sirius while cruising in the Bahamas area. The experiment demonstrated the feasibility and practicality of using a low-orbit satellite system as an aid to search and rescue operations. The accuracy of the doppler-determined latitude and longitude of the transmitting vessel would reduce the radius to search within 2 n. mi. most of the time. The experiment also demonstrated the feasibility and high degree of reliability of transmitting messages by a simple code using a low-power, low-cost keyboard encoding device. These messages enhance the value of the position location by defining the specific type and extent of the emergency. J.M.S.

N83-14861*# Centre de Recherches Atmospheriques, Magnay-les-Hameu (France).

PROJECT MARISONDE

M. Marcel Petit *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 86-88 (For primary document see N83-14835 05-47)

Avail: NTIS HC A06/MF A01 CSCL 04B

The Marisonde program aimed at designing, developing, building, and deploying a number of meteorological buoys to be used ultimately in the first global GARP experiment is described. Marisonde A was designed for coastal survey, which relayed data by radio to a nearby coastal station. Marisonde B was a second generation of buoys that were RAMS equipped and were deployed in the Mediterranean Sea and the Atlantic Ocean to validate overall system and equipment performance. Marsionde B is a very light, easily handled free-floating spar buoy that telemeters barometric pressure and sea water surface temperature via the Nimbus 6 RAMS. Marisonde buoy trajectories in the tropical Atlantic Ocean and in the Mediterranean Sea are discussed. J.M.S.

N83-14862*# National Oceanic and Atmospheric Administration, Bay St. Louis, Miss. National Space Technology Lab.

DRIFTING BUOY EQUIPMENT DEVELOPMENT **c48**

Michael Hall and E. G. Kerut *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. (For primary document see N83-14835 05-47)

Avail: NTIS HC A06/MF A01 CSCL 08C

Development of low cost expendable drifting buoys for use in conjunction with TWERLE RAMS on Nimbus 6 is addressed. The initial concept was for use with a drogue for measuring ocean currents. This concept was expanded to include measurement of other oceanographic and meteorological parameters including wind speed, barometric pressure, air temperature, sea surface temperature, and water temperature at depths from 5 to 100 m. The buoy was made up of a low-cost spar hull, a BTT, a UHF antenna, a battery supply, and a minimal sensor site. By the end of 1976, over 200 BTT platforms had been deployed. A summary of the reliability analysis of all known buoy deployments from Nimbus 6 launch through December 15, 1976, is given. The confidence factor represents the probability that 75 percent of randomly selected units will have a value of MTTF equal to or greater than the value indicated. J.M.S.

N83-14863*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A RADIONUCLIDE COUNTING TECHNIQUE FOR MEASURING WIND VELOCITY AND DIRECTION Patent Application

Jag J. Singh, inventor (to NASA) Filed 24 Nov. 1982 23 p (NASA-Case-LAR-12971-1; US-Patent-Appl-SN-444149) Avail: NTIS HC A02/MF A01 CSCL 04B

An anemometer utilizing a radionuclide counting technique for measuring both the velocity and the direction of wind is described. A pendulum consisting of a wire and a ball with a source of radiation on the lower surface of the ball is positioned by the wind. Detectors and are located in a plane perpendicular to pendulum (no wind). The detectors are located on the circumference of a circle and are equidistant from each other as well as the undisturbed (no wind) source ball position. NASA

N83-14864# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

AIR WEATHER SERVICE (AWS) CLIMATIC BRIEFS: AFRICA Data Summary

May 1982 16 p Supersedes USAFETAC/DS-79/093; AD-A082097 (AD-A118452; AD-E850189; USAFETAC/DS-81/059; USAFETAC/DS-79/093) Avail: NTIS HC A02/MF A01 CSCL 04/2

The AWS Climatic Briefs provide summarized monthly and annual climatic data for specific locations. Different data summaries provide the information for different geographical areas. These areas are: North America (including Greenland and Bermuda); Latin America (including Mexico, West Indies, and dependent islands): Europe (including North Atlantic islands); USSR and Mongoiian Peoples Republic; Peoples Republic of China (no Climatic Briefs at this time); Asia (Turkey and Cyprus to Indonesia and Japan); Africa (including Malagasy); and Antarctica, Australia, and Oceania. Meteorological elements included are: temperature, precipitation, relative humidity, vapor pressure, dew point, pressure altitude, surface wind, mean cloud cover, thunderstorm and fog days, flying weather, and typhoon and hurricane data. GRA

N83-14865# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

AIR WEATHER SERVICE (AWS) CLIMATIC BRIEFS: EUROPE Data Summary

May 1982 188 p Supersedes USAFETAC/DS-79/090; AD-A082094 (AD-A118450; USAFETAC/DS-81/056; USAFETAC/DS-79/090) Avail: NTIS HC A09/MF A01 CSCL 04/2

The AWS Climatic Briefs provide summarized monthly and annual climatic data for specific locations. Different data summaries provide the information for different geographical areas. These areas are: North America (including Greenland and Bermuda); Latin America (including Mexico, West Indies, and dependent islands): Europe (including North Atlantic islands); USSR and Mongolian Peoples Republic; Peoples Republic of China (no Climatic Briefs at this time); Asia (Turkey and Cyprus to Indonesia and Japan); Africa (including Malagasy); and Antarctica, Australia, and Oceania. Meteorological elements included are: temperature, precipitation, relative humidity, vapor pressure, dew point, pressure altitude, surface wind, mean cloud cover, thunderstorm and fog days, flying weather, and typhoon and hurricane data. GRA

N83-14866# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

FLASH FLOODING EVENTS IN SOUTH CENTRAL TEXAS M.S. Thesis - Utah Univ.

Tom Wilson Utley, Jr. Aug. 1982 66 p refs (AD-A118977; AFIT/CI/NR/82-29T) Avail: NTIS HC A04/MF A01 CSCL 04/2

This study examined 16 cases of flash flooding, reported in the National Oceanographic and Atmospheric Administration Storm

Data publication, which occurred in the spring months of April through June for the 8-year period from 1973 through 1980. The area studied was bounded by the cities of Victoria, Del Rio, and Stephenville making a nearly equilateral triangle in south central Texas. A synoptic analysis indicated that all of the flooding events occurred with synoptic-scale convective rainfall activity and that rainfall was reported in the area for at least 48 hours prior to flooding. Synoptic analysis failed to verify a 'frontal' model. With the use of rawinsonde data from Del Rio, Victoria, and Stephenville, facsimile charts, and rain data, 18 meteorological elements were developed for statistical analysis. This analysis revealed a fair correlation between stability indices and moisture content indicators, and the potential for flash flooding. Decision logic tables were developed using linear regression equations in concert with rainfall information. When applied to the 8-year data base and to flash flooding events which occurred in 1981 they proved to be excellent predictors. When compared to the 1981 National Weather Service Quantitative Precipitation Forecast guidance they proved superior for operational use. GRA

N83-14867# Naval Postgraduate School, Monterey, Calif.
SINGLE-STATION ASSESSMENTS OF THE SYNOPTIC-SCALE FORCING ON THE MARINE ATMOSPHERIC BOUNDARY LAYER M.S. Thesis
John Patrick Gleason Jun. 1982 58 p refs
(AD-A119331) Avail: NTIS HC A04/MF A01 CSCL 04B

Knowledge of the large-scale vertical velocity is required to predict the evolution of the atmospheric planetary boundary layer (APBL). Since naval operations are often conducted in data sparse regions, single-station assessments of the vertical velocity are necessary. Data to evaluate such assessments were obtained from rawinsondes taken at San Nicolas Island, California. Vertical velocity estimates obtained by vertical integration of the moisture budget equation (Q-method) and by the adiabatic method were used to initialize an APBL 24-hour prediction model. RMS error statistics on predicted inversion height, potential temperature, and specific humidity were computed for the forecasts and compared to the RMS errors of a persistence forecast. Calculation of the vertical velocity by the Q-method showed the most promise. However, no single-station assessment method improved on the persistence forecasts. Author (GRA)

N83-14868# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
A SYNOPTIC/STATISTICAL ANALYSIS OF SUMMER SEASON CIRCULATION PATTERNS OVER EASTERN ANTARTICA DURING MOIST AIR INTRUSIONS M.S. Thesis
Ronald L. Fauquet Jun. 1982 89 p refs
(AD-A119321) Avail: NTIS HC A05/MF A01 CSCL 04/2

U.S. Navy weather forecasters in Antarctica provide forecast services for aviation and field operations of the U.S. Antarctic Research Programs. Due to a very limited conventional data, meteorological satellite imagery becomes a primary resource for circulation diagnosis. However, qualitative interpretation techniques, as used in Antarctica, fail to provide definitive information on the intensity of synoptic features. A compositing technique was used in the study to identify a 400 mb geopotential height anomaly pattern common to a satellite-observed cloud signature indicating most air intrusions onto the continent. Two test cases, one dependent and one independent, are explored to determine the usefulness of the height anomaly pattern as an operational analysis aid over the data sparse regions of eastern Antarctica. Finally, the model 400 mb analysis is compared qualitatively to the National Meteorological Center and Fleet Numerical Oceanography Center 500 mb analyses for the same times. The model developed on the study shows some promise of improving the operational Naval Support Force Antarctica circulation analyses in data poor areas. Author (GRA)

N83-14869# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
A STUDY OF EAST-COAST CYCLOGENESIS EMPLOYING QUASI-LAGRANGIAN DIAGNOSTICS M.S. Thesis
Peter R. Conant Jun. 1982 103 p refs
(AD-A119319) Avail: NTIS HC A06/MF A01 CSCL 04/2

The absolute vorticity and angular momentum budgets for the President's Day Cyclone, 18-19 February 1979, are evaluated employing the quasi-Lagrangian diagnostic technique in pressure coordinates. The First GARP Global Experiment (FGGE) Level III-b data set prepared by the European Center for Medium Range Weather Forecasts is used to define the storm and to calculate the budgets. Important differences are found between the FGGE and mass budget vertical motion estimates . The budget results illustrate the importance of inward eddy mode lateral transport and advection at upper levels and mean mode transport due to convergence at lower levels. The vertical redistribution plays a lesser role but is more significant in the angular momentum budget . The vertical vorticity advection and tilting terms are comparable in magnitude. The largest budget residuals occur during the period of most intense convection activity which indicates a need for a better understanding of the vertical redistribution processes. Author (GRA)

N83-14870# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF A PUFF DISPERSION MODEL FOR A COASTAL REGION M.S. Thesis
Stephen K. Rinard Jun. 1982 89 p refs
(AD-A119618) Avail: NTIS HC A05/MF A01 CSCL 13/2

The Risoe National Laboratory, Roskilde, Denmark, atmospheric puff dispersion model has been tested for an atmospheric-marine environment. This three-dimensional model simulates the relates of Gaussian pollutant puffs and predicts their concentration as they are diffused and advected downwind by a horizontally homogeneous, time-dependent wind. Atmospheric characteristics such as turbulence intensity, potential temperature gradient, buoyant heat flux, and maximum mixing depth have been considered. Model predicted pollutant concentrations have been compared to airborne sampled observations. The effect of coastal turbulence not observed by the single point meteorological measurements made onboard ship greatly affects the advection and diffusion of a plume as it moves onshore. Additional measurements/predictions particular to the coastal area will have to be incorporated into the model for it to accurately predict the onshore movement of pollutants. Author (GRA)

N83-14871# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MOVING BOUNDARY ISOTHERMAL FOG CHAMBER (MOBIFOC) M.S. Thesis
George Frederick Fisher May 1982 120 p refs
(AD-A119730; AFIT/CI/NR/82-52T) Avail: NTIS HC A06/MF A01 CSCL 04/2

A new instrument for the study of fog and haze is introduced. The moving Boundary Isothermal Fog Chamber is the first successful attempt to improve upon the operating ranges and reliability of these instruments since they were first introduced 10 years ago. This new concept utilizes moving sidewalls in a rectangular chamber of 2 x 20 x 58 cm and is capable of providing growth times far exceeding those in current instruments. The larger walls of the chamber (20 x 58 cm) are constructed of vulcanized rubber belts covered with a moisture absorbent material (Pellon) which are continually driven by a variable speed motor. The direction of flow is upward against gravity. The result of the marriage of moving sidewalls and upward flow is a nearly plug type flow capable of sustaining large haze droplets for an almost indefinite period of time. The advantages of this unique and innovative instrument are numerous, the least of which is the improvement in growth times over current instruments. The ability to suspend droplets and to directly observe them allow for the study of interaction of various aerosols, chemical processes and studies of visibilities in haze. The chamber has also been designed for later application of thermal gradients and, therefore, for use as a thermal gradient diffusion cloud chamber (TGDCC) which will also have extended growth times over current TGDCC's. GRA

N83-14872# Naval Postgraduate School, Monterey, Calif.
A COMPARISON OF TWO INITIALIZATION METHODS IN DATA

ASSIMILATION Ph.D. Thesis
Edward H. Barker Jun. 1982 161 p refs
(AD-A119599) Avail: NTIS HC A08/MF A01 CSCL 04/2

Two different initialization methods were developed and tested in global data assimilation experiments covering a five-day period. One method was based on the nonlinear normal mode initialization, and the other was based on the balance equation. Both techniques were developed using the calculus of variations methodology. In both methods, the initial divergence was computed from the forecast first-guess fields, except it was partially modified in the nonlinear normal mode method to improve the balance. The assimilation system used to test the initialization methods was developed for the global forecast model at the Fleet Numerical Oceanography Center. This model was adapted from the general circulation model developed at the University of California at Los Angeles. A comparison of the gravity wave noise from the two methods is given for versions of the model with and without heating. Other comparisons are given for divergence, precipitation rates, wave structure and cyclogenesis. The two methods are similar in their performance in data assimilation. The balance equation method is more flexible in weight specification and, consequently the forecasts verify with observations closer than the normal mode method. Author (GRA)

N83-14873# Oklahoma Univ., Norman.
A COMPOSITE STUDY OF COMMA CLOUDS AND THEIR ASSOCIATION WITH SEVERE WEATHER OVER THE GREAT PLAINS M.S. Thesis
James Peter Millard 1982 119 p refs
(Grant NSF ATM-80-19430)
(AD-A119654; AFIT/CI-NR-82-57T) Avail: NTIS HC A06/MF A01 CSCL 04/2

Thirty-five comma cloud systems which existed over the Great Plains during the 1980 and 1981 spring seasons (March through June) are analyzed using visible and infrared satellite imagery, rawinsonde data and gridded data sets. Each comma pattern is divided into eleven zones and the soundings from similar zones are then averaged together. Composite kinematic and thermodynamic quantities are examined on isobaric and relative-flow isentropic surfaces. Severe weather is also strtified by zone. Eighty percent of the severe events are found to have occurred in the comma tail (zones C, D and E). A case study of one particular comma cloud system (March 21 - 22, 1981) is examined separately. This case was characterized by rapid convective cloud growth which developed in situ within the dry intrusion. Development occurred along a dryline where surface convergence was strong and where cold air advection aloft increased the potential instability. Synoptic-scale vertical motions are calculated and found to be upward in the northern portion of the dry intrusion. Comparisons are made to the composite comma cloud. GRA

N83-14874# Weather Squadron (26th), Blytheville AFB, Ark. Detachment 14.
TERMINAL FORECAST REFERENCE NOTEBOOK
Apr. 1982 38 p
(AD-A119576) Avail: NTIS HC A03/MF A01 CSCL 04/2

The air weather service observations for germinal forecasting are outlined. The following parameters are included: topography, climatology weather regimes, and local forecast aids. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N83-14875 Oregon State Univ., Corvallis.
THE REFLECTION, TRANSMISSION AND SCATTERING OF INTERNAL WAVES AT OCEAN FRONTS Ph.D. Thesis
Phyllis Jean Stabeno 1982 141 p
Avail: Univ. Microfilms Order No. DA8224121

A theoretical model of the reflection, transmission, scattering, and production of internal gravity wave energy at an idealized front is developed. Two models, one consisting of two and the other of three layers, are examined. Slanting upwards the interfaces between the layers form a frontal structure, and within the frontal region there is a horizontally-sheared, geostrophic velocity. For normally incident waves, a WKB solution is obtained, showing that for sufficiently small wavelengths (relative to the frontal width) virtually all the energy is transmitted through the front without being scattered into other modes. The opposite is true for long waves. A two layer model for waves that are not necessarily normally incident is solved numerically. Along a curve of constant frequency the minimum reflection occurs for waves that are slightly skewed from normal incidence, while the fraction of energy reflected increases as the waves travel more parallel to the front. When critical layers occur, energy can be exchanged between the geostrophic low and the internal waves. When there is no critical layer, the Reynolds stress is invariant in the across front direction. When they do occur, the Reynolds stress is not necessarily invariant and is a measure of the amount of energy exchanged between the frontal structure and the internal wave field. Dissert. Abstr.

N83-14876# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.
AN OPERATIONAL SUMMARY OF THE BERMEX81-V3 EXPERIMENT: 17-19 SEPTEMBER 1981 Final Report
J. E. Matthews Jul. 1982 31 p refs
(AD-A119275; NORDA-TN-153) Avail: NTIS HC A03/MF A01 CSCL 08/10

During September 1981, a vertical array of eight hydrophones (VEDABS) was moored in deep water to the south of the island of Bermuda for engineering tests. While the array was in the water, a series of deep, large, explosive charges were detonated and acoustic projector towed on a radial away from the array. This report documents the generalized experimental design, array characteristics, and operational aspects of the experiment. (GRA)

N83-14877# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Arctic Seafloor Engineering.
UNDERSTANDING THE ARCTIC SEA FLOOR FOR ENGINEERING PURPOSES
1982 141 p refs
(Contract N00014-80-G-0034)
(AD-A119773) Avail: NTIS HC A07/MF A01 CSCL 08/10

This report identifies and assesses those arctic seafloor phenomena that influence the design and operation of facilities and platforms for exploring and producing oil, gas, and hard minerals both on and under the sea floor. It also identifies knowledge that is needed of seafloor phenomena and conditions, and, for several areas of major concern, recommends specific research. These recommendations are intended to enhance the ability of the engineer and operator to anticipate and avoid problems that may be posed by seafloor and coastal phenomena, and guard against the effects of such events as thaw subsidence and erosion. Permafrost, often thought to be found only on land, is found extensively beneath the sea floor of the Beaufort Sea, and, to an extent not well known, under the Chukchi and Bering seas. A relict of the geological past, it was covered by rising artic oceans. Permafrost can deteriorate because of natural or man-induced effects and can reform again. GRA

N83-14878# Coastal Engineering Research Center, Fort Belvoir, Va.
BEACH PROFILE ANALYSIS SYSTEM (BPAS). VOLUME 7: BPAS USER'S GUIDE, ANALYSIS MODULE ELVDIS
Marilyn V. Fleming, Timothy J. Lawler, and Diane French Jun. 1982 52 p Sponsored by Army 8 Vol.
(AD-A119453; CERC-TR-82-1-Vol-7) Avail: NTIS HC A04/MF A01 CSCL 08/6

This report provides user instructions for processing analysis module ELVDIS, a part of the Beach Profile Analysis System

(BPAS). The BPAS is a package of computer programs which edit and analyze beach profile data. The objective of the analysis is to compute and display changes in unit volume, shoreline position, and a profile geometry. ELVDIS displays beach profile changes, through time, by providing plots and tables of elevation changes at points on profile lines. Included are the elevations at specific points during each survey and profile envelopes, showing the maximum and minimum points for all surveys. GRA

N83-14879# Coastal Engineering Research Center, Fort Belvoir, Va.
BEACH PROFILE ANALYSIS SYSTEMS (BPAS). VOLUME 6: BPAS USER'S GUIDE, ANALYSIS MODULE VOLCTR
Marilyn V. Fleming and Timothy J. Lawler Jun. 1982 51 p Sponsored by Army 8 Vol.
(AD-A119452; CERC-TR-82-1-Vol-6) Avail: NTIS HC A04/MF A01 CSCL 08/6

This report provides user instructions for processing analysis module VOLCTR, a part of the Beach Profile Analysis System (BPAS). The BPAS is a package of computer programs which edit and analyze beach profile data. The objective of the analysis is to compute and display changes in unit volume, shoreline position, and a profile geometry. VOLCTR displays beach profile changes, through time, at a locality by providing plots and tables of unit volume changes between specific contours. Unit volumes within selected contour segments are computed and compared from one survey to the next. Also computed and tabulated are several statistics on unit volume changes between the same surveys at all profile lines. GRA

N83-14880# Coastal Engineering Research Center, Fort Belvoir, Va.
BEACH PROFILE ANALYSIS SYSTEM (BPAS). VOLUME 5: BPAS USER'S GUIDE, ANALYSIS MODULE BEACH
Marilyn V. Fleming and Timothy J. Lawler Jun. 1982 66 p Sponsored by Army 8 Vol.
(AD-A119451; CERC-TR-82-1-Vol-5) Avail: NTIS HC A04/MF A01 CSCL 08/6

This report provides user instructions for processing analysis module BEACH, a part of the Beach Profile Analysis System (BPAS). The BPAS is a package of computer programs which edit and analyze beach profile data. The objective of the analysis is to compute and display changes in unit volume, shoreline position, and a profile geometry. BEACH displays beach profile changes, through time, at a locality by providing tabular and graphical displays of shoreline and unit volume changes. The module also displays the results of linear regression analysis correlating shoreline and unit volume changes with time and with one another. GRA

N83-14881# Coastal Engineering Research Center, Fort Belvoir, Va.
BEACH PROFILE ANALYSIS SYSTEM (BPAS). VOLUME 4: BPAS USER'S GUIDE, ANALYSIS MODULE SURVY2
Marilyn V. Fleming and Timothy J. Lawler Jun. 1982 62 p Sponsored by Army 8 Vol.
(AD-A119450; CERC-TR-82-1-Vol-4) Avail: NTIS HC A04/MF A01 CSCL 08/6

This report provides user instructions for processing analysis module SURVY2, a part of the beach Profile Analysis System (BPAS). The BPAS is a package of computer programs which edit and analyze beach profile data. The objective of the analysis is to compute and display changes in unit volume, shoreline position, and profile geometry. SURVY2 displays beach profile changes, through time, at a locality by providing plots and tables of the changes in distance to selected beach contours. The means of these distances through time at a locality are also computed and displayed, along with linear regression analysis of the change in shoreline position through time. GRA

N83-14882# Coastal Engineering Research Center, Fort Belvoir, Va.
BEACH PROFILE ANALYSIS SYSTEM (PBAS). VOLUME 3: BPAS USER'S GUIDE, ANALYSIS MODULE SURVY1
Marilyn V. Fleming and Timothy J. Lawler Jun. 1982 49 p Sponsored by Army 8 Vol.
(AD-A119449; CERC-TR-82-1-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 08/6

This report provides user instructions for processing analysis module SURVY1, a part of the Beach Profile Analysis System (BPAS). The BPAS is a package of computer programs which edit and analyze beach profile data. The objective of the analysis is to compute and display changes in unit volume, shoreline position, and a profile geometry. SURVY1 displays beach profile changes, through time, at a locality by providing plots of the actual profile cross sections. Also available is a tabular listing of distance to, and slope of, the profile at the shoreline position. GRA

N83-14883# Coastal Engineering Research Center, Fort Belvoir, Va.
BEACH PROFILE ANALYSIS SYSTEM (BPAS). VOLUME 2: BPAS USER'S GUIDE, THE EDITING ROUTINES, EDIT1 AND EDIT2
Marilyn V. Fleming and Timothy J. Lawler Jun. 1982 55 p Sponsored by Army 8 Vol.
(AD-A119448; CERC-TR-82-1-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 08/6

This report provides user instructions for processing programs EDIT1 and EDIT2, a part of the Beach Profile Analysis System (BPAS). The BPAS is a package of computer programs which edit and analyze beach profile data. The EDIT1 program edits the data and the EDIT2 program prepares the data for processing through the analysis routines. GRA

N83-14884# Coastal Engineering Research Center, Fort Belvoir, Va.
BEACH PROFILE ANALYSIS SYSTEM (BPAS). VOLUME 1: SYSTEM OVERVIEW
Marilyn V. Fleming and Allan E. DeWall Jun. 1982 69 p refs Sponsored by Army 8 Vol.
(AD-A119447; CERC-TR-82-1-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 08/6

This report describes the structure and use of the Beach Profile Analysis System (BPAS), a package of computer programs derived from computer programs developed over several years as part of the Coastal Engineering Research Center (CERC) Beach Evaluation Program (BEP). In the course of the BEP, approximately 20,000 coastal profile line surveys were collected over a 15-year period at 23 localities along the U.S. east coast, gulf coast, west coast, and the coast of Lake Michigan (for background information, see Galvin, 1969). These computer programs were also used to analyze laboratory survey data collected during CERC's Laboratory Effects in Beach Studies (LEBS) project. The BPAS, the primary function of which is to compute and display shoreline and volmetric changes, was designed to analyze beach profile data and laboratory profile data with the objective of obtaining conclusions of value in coastal engineering. Volumes II to VIII are User's Guides. GRA

N83-14885# Planning Systems, Inc., McLean, Va.
A PHYSICAL SEDIMENT MODEL FOR THE PREDICTION OF SEAFLOOR GEOACOUSTIC PROPERTIES Final Report, 1 Jan. - 30 Jul. 1982
Burlie A. Brunson and Eugene J. Molinelli Jul. 1982 144 p refs (Contract N00014-82-C-0121)
(AD-A119445; PSI-TR-216227) Avail: NTIS HC A07/MF A01 CSCL 08/10

A study was performed to adapt, implement, and test a version of the Biot/Stoll physical sediment model in a form which allows the prediction of those geoacoustic properties needed by current Navy acoustic or bottom loss calculation models. Particular attention was paid to the depth and frequency dependence of compressional wave speed and attentuation; two properties considered to be most important to acoustic modeling. Additionally, input sensitivity studies yielded insight into certain 'critical factors' important to accurate geoacoustic property predictions. Model predictions of seafloor geoacoustic properties were compared with

speed and attenuation values measured directly or inferred from acoustic measurements for a deep water site near DSDP site 135, and a shallow water site near Panama City, Florida. The acoustic significance of observed differences in geoacoustic properties was assessed by comparing the outputs of a complex reflection coefficient model using inputs derived from physical sediment properties using the Biot/Stoll approach and inputs derived from acoustical measurements using the inversion technique developed for the Bottom Loss Upgrade (BLUG). The study yield positive evidence that the physical seidment approach is useful. The Biot/Stoll model is a potentially powerful tool for estimating or extrapolating geoacoustic parameters, particularly when a priori estimates are needed in geogrpahic areas or frequency regimes which have not been acoustically surveyed.
Author (GRA)

N83-14886# Brookhaven National Lab., Upton, N. Y.
WAVE INDUCED VARIATIONS IN THE MARINE SURFACE LAYER TURBULENCE AND MONENTUM FLUX
S. SethuRaman 1981 42 p refs Presented at Symp. on Wave Dynamics and Radio Probing of the Ocean Surface, Miami Beach, Fla., 13 May 1981
(Contract DE-AC02-76CH-00016)
(DE82-002857; BNL-30265; CONF-8105129) Avail: NTIS HC A03/MF A01

An air sea interaction experiment was conducted in the Atlantic Ocean 5 km off the southern shore of Long Island using a stable buoy. Variations of momentum flux and turbulence in the marine surface layer were studied continuously for several weeks. The changes in the momentum flux and turbulence during synoptic conditions conductive for the formation of long waves were studied. Upward momentum flux from the long waves to the atmosphere decreases the average downward fluxes to near zero levels. Immediately after a synoptic frontal passage when the wind and the waves were moving in the opposite directions, the average momentum flux was directed upwards from the waves to the atmosphere. During this period longitudinal turbulence intensity increased by a factor of six and the vertical turbulence showed a moderate increase. GRA

N83-14849*# Raytheon Co., Portsmouth, R. I.
NEW ENGLAND OUTER CONTINENTAL SHELF PHYSICAL OCEANOGRAPHY PROGRAM
Ronald A. Franklin *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 45 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 04B

N83-14850# National Ocean Survey, Rockville, Md. Atlantic Oceanographic and Meteorological Labs.
SURFACE CURRENTS IN THE CARRIBEAN SEA
Donald V. Hansen *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 46-48 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08C

N83-14852*# National Museum of Natural History, Paris (France).
ICEBERG TRACKING IN THE ANTARCTIC
P. Tchernia *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 54-55 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08L

N83-14854*# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Snow and Ice Branch.
ANTARCTIC SEA ICE DATA BUOYS
Stephen F. Ackley *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 58-59 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08C

N83-14855*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ICE FLOE TRACKING IN THE ARCTIC
William S. Dehm (Sea Ice Consultants, Camp Springs, Md.) *In its* Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 60 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08C

N83-14856*# Washington Univ., Seattle.
ARCTIC ICE DYNAMICS JOINT EXPERIMENT
Norbert Untersteiner *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 61 Translation was announced as N68-20861 Sponsored in part by National Science Foundation, the Navy, Canadian Polar Continental Shelf Project and National Oceanic and Atmospheric Administration (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08L

N83-14857*# Norsk Polarinstitutt, Oslo.
ICE DRIFT EXPERIMENT IN THE SVALBARD-GREENLAND AREA
Torgny Vinje and Thor Haegh (Royal Norwegian Council for Scientific and Industrial Research, Oslo) *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 62-63 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08L

N83-14858*# Chevron Oil Field Research Co., La Habra, Calif.
WEST GREENLAND ICEBERG DRIFT AND OCEAN CURRENT INVESTIGATIONS
Larry Brooks *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 64-65 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01

N83-14862*# National Oceanic and Atmospheric Administration, Bay St. Louis, Miss. National Space Technology Lab.
DRIFTING BUOY EQUIPMENT DEVELOPMENT
Michael Hall and E. G. Kerut *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 08C

N83-14941# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
ADI PROCEDURES FOR SOLVING THE SHALLOW-WATER EQUATIONS IN TRANSFORMED COORDINATES
H. L. Butler and Y. P. Sheng (Aeronautical Research Associates of Princeton, Inc.) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 365-381 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08C

N83-14944# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
A TSUNAMI GENERATION AND PROPAGATION MODEL DRIVEN BY VERTICAL SEABED MOVEMENTS
Jeff Earickson *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 429-456 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08/3

N83-14945# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
THEORY AND CALCULATION OF THE NON-LINEAR ENERGY TRANSFER BETWEEN SEA WAVES IN DEEP WATER
Barbara A. Tracy and Donald T. Resio (Oceanweather, Inc.) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 457-476 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08/3

N83-14948# Aeronautical Research Associates of Princeton, Inc., N. J.

A THREE-DIMENSIONAL NUMERICAL MODEL OF COASTAL, ESTUARINE AND LAKE CURRENTS
Y. P. Sheng and H. L. Butler (Army Engineer Waterways Experiment Station) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 531-574 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08/3

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N83-14887 Defence Research Information Centre, Orpington (England).
SPECTRAL LUMINESCENCE CHARACTERISTICS OF SEVERAL SPECIES OF SEA ALGAE
P. P. Martsenyuk and V. N. Karnaukhov Jul. 1982 11 p refs Transl. into ENGLISH from Biol. Morya (Kiev), v. 51, 1979 p 55-59
(DRIC-T-6618; BR84488) Copyright. Avail: Issuing Activity

The luminescence spectra of single cells of several species of sea algae in the normal state, and as affected by radiation in the visible region of the spectrum, were studied. Differences observed in the initial luminescence spectra and in the changes of the spectra during pigment photodestruction are discussed. The data show that the luminescent spectral characteristics can be used as an additional criterion for determining the taxonomic position of algal cells. Author (ESA)

N83-14888 Defence Research Information Centre, Orpington (England).
THE SPECTRAL COMPOSITION OF THE BIOLUMINESCENT FIELD IN THE BLACK AND MEDITERRANEAN SEAS AND IN THE ATLANTIC OCEAN
E. P. Bityukov, V. I. Vasilenko, and Y. N. Tokarev Aug. 1982 21 p refs Transl. into ENGLISH from Biol. Morya (Kiev), v. 47, 1978 p 40-49
(DRIC-T-6619; BR84487) Copyright. Avail: Issuing Activity

The spectral composition of the bioluminescence of pelagic organisms and of the luminous field created by them were studied. Determination of the bioluminescent field spectrum by a spectrobathy photometer with three detectors is described. The spectrum maximum in the Black Sea and the tropical Atlantic is 480nm, while in the Mediterranean it is shifted by 10 to 15nm towards the long wave region. Author (ESA)

N83-14889# American Association for the Advancement of Science, Washington, D.C.
LIFE SCIENCES IN THE SERVICE OF ALASKA. PROCEEDINGS OF THE 32ND ALASKA SCIENCE CONFERENCE
1981 209 p Proc. Held at Fairbanks, Alaska, 25-27 Aug. 1981 (Contract DE-AT06-81ER-60026)
(DE82-001744; DOE/ER-60026-1; CONF-810883) Avail: NTIS HC A10/MF A01

Life science in Alaska was examined. Proceedings include papers in the basic biological sciences as related to Alaska and the Canadian Arctic regions. The present and potential impacts of man on the Alaskan environment are also considered. Author

N83-14890# Washington Univ., Seattle.
LYMPHOCYTE FORMATION, LIFE SPAN, FATE AND POTENTIAL FOR REPOPULATING HEMOPOIETIC TISSUES OF IRRADIATED ANIMALS Progress Report, 1977 - 1978
N. B. Everett 1981 5 p refs
(Contracts DE-AT06-76EV-70016; AT(45-1)-2225)
(DE82-002435; RLO-2225/T16-41) Avail: NTIS HC A02/MF A01

Research progress for the year 1977-1978 is summarized. The objectives were to explore the capacity of bone marrow pre-T cells for generating immunocompetent progeny after transplantation, and to characterize pre-B cells in the bone marrow and spleen. GRA

N83-14851*# Alaska Dept. of Fish and Game, Fairbanks.
SATELLITE RADIO TRACKING OF POLAR BEARS
Jack W. Lentfer and Douglas DeMaster (Minnesota Univ., Minneapolis) *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 52-53 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 06C

N83-14859*# National Oceanic and Atmospheric Administration, Bay St. Louis, Miss. National Space Technology Lab.
SATELLITE-LINKED PORPOISE TRACKING SYSTEM
E. G. Woods and A. Kemmerer *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 70-71 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 06C

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N83-14891* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 237
Oct. 1982 74 p
(NASA-SP-7011(237); NAS 1.21:7011(237)) Avail: NTIS HC $7.00 CSCL 06E

A bibliography is given on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. R.J.F.

N83-14892 Harvard Univ., Cambridge, Mass.
THE PREDICTION OF INDIVIDUAL MUSCLE FORCES DURING HUMAN MOVEMENT Ph.D. Thesis
Anthony Gerard Patriarco 1982 182 p
Avail: Univ. Microfilms Order No. DA8222686

A model of the musculosketetal system and the necessary experimental means to use the model were developed with the desire of producing a noninvasive, clinical tool capable of quantifying individual muscle behavior and subsequently assisting in the therapeutic correction of neuromuscular pathologies. First, a flexible model framework was constructed in which the body was viewed as a system of rigid links with the muscles treated as torque generators. A muscle force solution was sought which would allow the prediction of individual forces in an observed human movement. The indeterminate solution associated with a redundant number of muscles around a joint was addressed by optimizing one of a variety of criterion. Second, the ability of the model to predict muscle forces was tested in gait studies on normal subjects. Dissert. Abstr.

N83-14893 Defence Research Information Centre, Orpington (England).
FUNDAMENTAL EXPERIMENTAL ASPECTS OF LOW-RISK DECOMPRESSION FOLLOWING EXPOSURE TO HIGH PRESSURE
A. A. Buehlmann Jul. 1982 23 p refs Transl. into ENGLISH from Schweizerische Med. Wochenschr. (West Germany), v. 112, no.2, 1982 p 48-59
(DRIC-T-6629; BR84492) Copyright. Avail: Issuing Activity

In exposure tests to an ambient pressure of 3.92 bar or 4.41 bar in a hyperbaric chamber, 315 subjects breathed air or oxygen-helium mixture for periods between a few minutes and

several hours. Decompression was carried out without changing the breathing mixture or by breathing 100% oxygen and also with air breathing in the case of the helium exposure. A linear formula which calculates tolerated ambient pressure was derived. This rule yields decompression profiles which agree with the decompression tables of the US Navy after short air dives. The decompression times after long air dives are longer than those of the emergency tables of the US Navy. For long helium exposures, the American rule indicates much longer decompression times without greater security than those of the system described. Author (ESA)

N83-14894 Defence Research Information Centre, Orpington (England).
LENS CHANGES IN THE FORM OF RADIATION CATARACTS
B. Tengroth Aug. 1982 11 p refs Transl. into ENGLISH from Arbeitsmed. Sozialmed. Praeventivemed. (West Germany), v. 16, no. 2, 1981 p 36-39
(DRIC-T-4740; BR84623) Copyright. Avail: Issuing Activity

The risk of cataracts to workers exposed to high levels of IR radiation and microwaves is discussed. Links between IR radiation and lens opacity are reviewed. A study of the incidence of cataracts in workers in potentially hazardous environments does not prove the connection between infrared radiation and microwaves with cataracts. Author (ESA)

N83-14895 Defence Research Information Centre, Orpington (England).
HAZARDS TO MAN FROM MICROWAVE AND RADIO WAVES
J. H. Bernhardt Aug. 1982 9 p refs Transl. into ENGLISH from Arbeitsmed. Sozialmed. Praeventivmed. (West Germany) v. 16, no. 2, 1981 p 33-36
(DRIC-T-6742; BR84637) Copyright. Avail: Issuing Activity

The dosimetric concept of absorbed specific power, the frequency dependence of which serves as a basis for the establishment of protection standards, is discussed. For frequencies > 30 MHz, the 10 mW/sq cm limit is supported. For frequencies in the 10 to 30 MHz range, electrical and magnetic field strength must be considered, rather than thermal stressing factors. Below 100 kHz, field-induced potential differences may be important. Author (ESA)

N83-14896*# Massachusetts Inst. of Tech., Cambridge. Man Vehicle Lab.
A HEURISTIC MATHEMATICAL MODEL FOR THE DYNAMICS OF SENSORY CONFLICT AND MOTION SICKNESS
Charles M. Oman 1982 44 p refs Repr. from Acta Oto-Laryngol., Suppl. 392 (Sweden),
(Contracts NAS9-15343; NCC9-1; Grant NsG-2032)
(NASA-CR-169683; NAS 1.26:169683; MVT-80-1;
ISSN-0365-5237) Avail: NTIS HC A03/MF A01 CSCL 06E

The etiology of motion sickness is now usually explained in terms of a qualitatively formulated sensory conflict hypothesis. By consideration of the information processing task faced by the central nervous system in estimating body spatial orientation and in controlling active body movement using an internal model referenced control strategy, a mathematical model for sensory conflict generation is developed. The model postulates a major dynamic functional role for sensory conflict signals in movement control, as well as in sensory motor adaptation. It accounts for the role of active movement in creating motion sickness symptoms in some experimental circumstances, and in alleviating them in others. The relationship between motion sickness produced by sensory rearrangement and that resulting from external motion disturbances is explicitly defined. A nonlinear conflict averaging model describes dynamic aspects of experimentally observed subjective discomfort sensation, and suggests resulting behavior. S.L.

N83-14897# European Space Agency, Paris (France).
ZERO-g SIMULATION FOR GROUND-BASED STUDIES IN HUMAN PHYSIOLOGY, WITH EMPHASIS ON THE CARDIOVASCULAR AND BODY FLUID SYSTEMS
Norman Longdon, ed. Aug. 1982 158 p refs Partly in ENGLISH and FRENCH Workshop held in Toulouse, 4-5 Mar. 1982; sponsored by ESA and CNES
(ESA-SP-180; ISSN-0379-6566) Avail: NTIS HC A08/MF A01

Bed rest, water immersion, lower body negative pressure and tilt table studies of the physiological effects of weightlessness were discussed. Space mission experience was compared with simulation. The need to standardize experimental design was stressed. For individual titles, see N83-14898 through N83-14903.

N83-14898# Centre Hospitalier Universitaire Rangueil, Toulouse (France). Lab. d'Hemodynamique.
DECUBITUS AS A METHOD OF SIMULATING THE CARDIOVASCULAR AND METABOLIC EFFECTS OF MICROGRAVITY ON THE HUMAN BODY [LE DECUBITUS COMME METHODE DE SIMULATION DES EFFETS CARDIOVASCULAIRES ET METABOLIQUES OBSERVES CHEZ L'HOMME PLACE SOUS MICROGRAVITE]
A. Guell, Ph. Dupui, Cl. Gharib (Lyon Univ.), and A. Bess *In* ESA Zero-g Simulation for Ground-Based Studies in Human Phys., with Emphasis on the Cardiovascular and Body Fluid Systems Aug. 1982 p 3-9 refs In FRENCH (For primary document see N83-14897 05-52)
Avail: NTIS HC A08/MF A01

Horizontal and head down simulation studies of weightlessness are reviewed. Results from these studies are compared with those from space flight. Objectively and subjectively, head down decubitus closely reproduces symptoms described by astronauts, arising from the displacement of fluid towards the upper body, especially the brain. Results concerning hydroelectrolytic balance and its hormonal regulation are consistent (e.g., increased diuresis, increased hematocrit), but data on the evolution of hormone rates varies considerably. This is ascribed to non-standardized experimental design. Author (ESA)

N83-14899# Hopital Bellevue Saint Etienne (France). Dept. de Readaptation Medicale.
INFLUENCE OF IMMOBILITY AND WEIGHTLESSNESS ON BONE TISSUE [INFLUENCE DE L'IMMOBILISATION ET DE L'IMPESANTEUR SUR LE TISSU OSSEUX]
P. Minaire and C. Alexandre *In* ESA Zero-g Simulation for Ground-Based Studies in Human Phys., with Emphasis on the Cardiovascular and Body Fluid Systems Aug. 1982 p 11-21 In FRENCH (For primary document see N83-14897 05-52)
Avail: NTIS HC A08/MF A01

The biochemical, histomorphometric, and vascular effects of immobility and weightlessness in man and animals are outlined. The orthophysiopathologies of immobility and weightlessness are compared. Immobility and weightlessness cause a loss of bone tissue of up to 1/3 of total trabecular bone mass. The cortical bones also lose mass. These losses are due to overabsorption of bone tissue because of local vascular modifications, and under formation of bone because of the absence of mechanical stimulation. Immobility-weightlessness comparisons are of limited value because of the continuing effects of gravity in immobility studies, and nonstandardized experimental design. Author (ESA)

N83-14900# Deutsche Sporthochschule, Cologne (West Germany). Physiologisches Inst.
A CRITICAL EVALUATION OF THE EMPLOYMENT OF WATER IMMERSION TECHNIQUES IN INVESTIGATIONS RELATING TO PHYSIOLOGICAL REACTIONS DURING SPACE FLIGHT
W. Skipka and U. Schram *In* ESA Zero-g Simulation for Ground-Based Studies in Human Phys., with Emphasis on the Cardiovascular and Body Fluid Systems Aug. 1982 p 29-38 refs (For primary document see N83-14897 05-52)
Avail: NTIS HC A08/MF A01

Inconsistencies between immersion test predictions and space flight findings, e.g. as regards aldosterone suppression or diuresis are discussed. Three reasons are given for these discrepancies: the counter-regulatory stage and the adaptation stage of space flight, which are especially important for hormone as well as fluid and electrolyte balance, are not frequently simulated by immersion. While most of the results of immersion experiments are taken

from data recorded during complete rest, data collected in space are heavily influenced by physical work. Subjects in immersion experiments are unlikely to be as physically fit as those who take part in space flights. Author (ESA)

N83-14901# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Aerospace Medicine.

LOWER BODY NEGATIVE PRESSURE (LBNP): A METHOD OF CONTROLLED CIRCULATION DISORDER

F. Baisch, J. Beier, U. Gebhardt, J. R. Hordinsky, and H. Morsbach *In* ESA Zero-g Simulation for Ground-Based Studies in Human Phys., with Emphasis on the Cardiovascular and Body Fluid Systems Aug. 1982 p 43-75 refs (For primary document see N83-14897 05-52)

Avail: NTIS HC A08/MF A01

The effects of LBNP, spaceborne and ground based investigations of these effects, and LBNP experimental design are discussed. In general, LBNP leads to a shift of intrathoracal blood volume into the body regions exposed to negative pressure. The LBNP-induced responses in the arterial system are similar to those seen in head up tilt (HUT). However, in LBNP venous pressure is uniformly reduced, whereas in HUT venous pressure increases down the long body axis. The LBNP also imposes humoral stimuli: responses of catecholamines, their precursors and metabolites in blood and urine, and increases of renin, aldosterone, and cortisol are reported. In order to reproduce equal effects on the intrathoracal organs, it is suggested that LBNP protocols be adapted to integral lower body compliance. Author (ESA)

N83-14902# Graz Univ. (Austria). Physiologisches Inst.

TILT TABLE AND RELATED STUDIES

H. Hinghofer-Szalkay *In* ESA Zero-g Simulation for Ground-Based Studies in Human Phys., with Emphasis on the Cardiovascular and Body Fluid Systems Aug. 1982 p 81-102 refs (For primary document see N83-14897 05-52)

Avail: NTIS HC A08/MF A01

Short term physiological events which occur in the human body after changes in the direction of gravitational force are discussed. The effect of posture on exercise performance is considered. Hemodynamic changes, blood volume and capillary fluid shifts, hormonal changes, and the receptor areas involved in modulating the autonomous responses are treated. Circulation in the head, lungs, abdomen, skin, and muscles is described. The physical and psychological discrepancies between ground based experiment and space flight are mentioned. Author (ESA)

N83-14903*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CARDIOVASCULAR RESPONSES TO WEIGHTLESSNESS AND GROUND-BASED SIMULATIONS

H. Sandler *In* ESA Zero-g Simulation for Ground-Based Studies in Human Phys., with Emphasis on the Cardiovascular and Body Fluid Systems Aug. 1982 p 107-146 refs (For primary document see N83-14897 05-52)

Avail: NTIS HC A08/MF A01

Mission experience, from NASA and Soviet programs, on human cardiovascular responses to weightlessness, and the ability of bed rest studies to simulate these are discussed. In-flight effects include fluid shift to the upper body, decreased heart size, bone demineralization, orthostatic intolerance, and loss of exercise tolerance. All the cardiovascular changes that occur with weightlessness also occur with prolonged bed rest. They are most manifest when subjects stand suddenly, or undergo tilting or lower body negative pressure. The mechanisms which control these responses, e.g., the role of the central nervous system, are unclear. Author (ESA)

N83-14904# Army Research Inst. of Environmental Medicine, Natick, Mass.

HYPOHYDRATION AND EXERCISE: EFFECTS OF GENDER, ENVIRONMENT AND HEAT ACCLIMATION

Michael N. Sawka, Michael M. Toner, Ralph P. Francesconi, and Kent B. Pandolf 19 Jul. 1982 33 p refs

(DA Proj. 3E1-62777-A-878)

(AD-A118669; USARIEM-M-38/82) Avail: NTIS HC A03/MF A01 CSCL 06/19

The effects of heat acclimation and subjects gender on treadmill exercise in a comfortable hot-dry and a hot-wet environment while subjects were hypo or dehydrated were examined. Six male and six female subjects, matched for maximal aerobic power and percent body fat, attempted two exercise tests in environment both before and after a 10-day heat acclimation program. No significant differences were noted between men and women at the completion of exercise for rectal temperature (Tre), mean skin temperature (Tsk) or heart rate (HR) during any of the experimental conditions. Hypohydration was generally found to increase Tre and HR responses as well as to decrease sweat rate value while not altering Tsk responses. In the hypohydration experiments, heat acclimation significanlty reduced Tre and HR responses in the comfortable environments, but reduced only HR responses in the hot-dry and hot-wet environments. It is indicated that men and women respond in a physiologically similar manner to hypohydration during exercise. It is also suggested that an expanded plasma volume, mediated by heat acclimation, may have attenuated Tre and HR responses during hypohydration. GRA

N83-14905# Beth Israel Medical Center, N.Y. Dept. of Pathology.

STUDIES ON THE MECHANISM AND PREVENTION OF DECOMPRESSION SICKNESS Final Technical Report, 1 Jun. 1968 - 28 Feb. 1982

Chryssanthos Chryssanthou 12 Jul. 1982 155 p refs

(Contract N00014-75-C-0312)

(AD-A118623) Avail: NTIS HC A08/MF A01 CSCL 06/19

The studies focused on three main areas: Decompression Sickness, Dysbaric Osteonecrosis and Dysbaric Alteration of the Blood-Brain Barrier. On decompression sickness, attempts were made to elucidate pathogenetic mechanisms. Several hypotheses were advanced and novel pathogenetic concepts were proposed. On the basis of new theoretical considerations we were able to develop means for the prevention or amelioration of the disease. Regarding dysbaric osteonecrosis, we developed an animal model which permitted studies on the etiology predisposition and pathogenesis of the disorder. The most recent investigations covered by this report involve dysbaric modification of blood-tissue barriers, an observation which was made in our Laboratories few years ago. The report includes an overview (summary) of the investigations conducted in these areas with references to pertinent publications. In lieu of detailed description of the work done, reprints to pertinent publications. In lieu of detailed description of the work done, reprints of representative articles have been attached. We hope that this material might be of help to those interested in the fields of dysbaric disorders. GRA

N83-14906# Pennsylvania Univ., Philadelphia. School of Medicine

MAPPING OF FUNCTIONAL ACTIVITY IN BRAIN WITH 18F-FLUORO-DEOXYGLUCOSE

A. Alavi, M. Reivich, J. Greenberg, and A. Wolf (Brookhaven National Lab., Upton, N.Y.) 1981 4 p refs Presented at the European Soc. of Nucl. Med., Bern, 8 Sep. 1981 Sponsored in part by US Public Health Service

(Contract DE-AC02-76CH-00016)

(DE82-002856; BNL-30224; CONF-810996-1) Avail: NTIS HC A02/MF A01

A model based on the assumptions of a steady state for glucose consumption, a first order equilibration of the free 14C-DG pool in the tissue with the plasma level, and relative rates of phosphorylation of 14C-DG and glucose determined by their kinetic constants for hexokinase reaction was desired. Using an operational equation based on this model, the metabolic rates of glucose are calculated in various regions of brain. 14C is a beta emitter and therefore not suitable for noninvasive imaging in man. With the synthesis of 18F-2-deoxy-2-fluoro-D-glucose (18F-DG) all of the requirements for a suitable radiopharmaceutical for the determination of local

cerebral metabolism are met. This agent behaves very similarly to 14C-DG and therefore, using the above described model and emission tomography, it is possible to measure regional cerebral metabolism for the first time in man. DOE

N83-14907# California Univ., Los Angeles. Lab. of Biomedical and Environmental Sciences.
DEOXYGLUCOSE METHOD FOR THE ESTIMATION OF LOCAL MYOCARDIAL GLUCOSE METABOLISM WITH POSITRON COMPUTED TOMOGRAPHY
Osman Ratib, Michael E. Phelps, Sung Cheng Huang, Eberhard Henze, Carl E. Selin, and Heinrich R. Schelbert 1981 23 p refs
(Contract DE-AC03-76SF-00012)
(DE82-004306; UCLA-12-1324) Avail: NTIS HC A02/MF A01

The deoxyglucose method originally developed for measurements of the local cerebral metabolic rate for glucose was investigated for its application to studies of the heart with positron computed tomography (PCT) and FDG. Studies were performed in dogs to measure the tissue kinetics of FDG with PCT and by direct arterial venous sampling. The FDG method accurately predicted the true MMRGlc even when the glucose metabolic rate was normal but myocardial blood flow (MBF) was elevated five times the control value or when metabolism was reduced to 10% of normal and MBF increased five times normal. Improvements in PCT resolution are required to improve the accuracy of the estimates of the rate constants and the MMRGlc. DOE

N83-14908# Pacific Northwest Lab., Richland, Wash.
DISSOLUTION RATES OF URANIUM COMPOUNDS IN SIMULATED LUNG FLUID
D. R. Kalkwarf 1981 14 p refs Presented at the 21st Hanford Life Sci. Symp. on Biol. Availability of Trace Metals, Richland, Wash., 4 Oct. 1981
(Contract DE-AC06-76RL-01830)
(DE82-003857; PNL-SA-9589; CONF-811035-4) Avail: NTIS HC A02/MF A01

Maximum dissolution rates of uranium into simulated lung fluid from a variety of materials were measured at 37 deg in the where f/sub i/ is to estimate clearance rates from the deep lung. A batch procedure was utilized in hich samples containing as little as 10 micro of natural urnaium could be tested. The materials included: products of uranium mining, milling and refining operations, coal fly ash, an environmental sample from a site exposed to multiple uranium sources, and purified samples of (NH4) 2U2O7U3O8, UO2, and UF4. Dissolution of uranium from several materials indicated the presence of more than one type of uranium compound. Dissolution occurred predominantly by formation of the [UO2(CO3)3]4- ion. Tetravalent uranium compounds dissolved slowly. It is found that dissolution rates of size separted yellow-cake aerosols are more closely correlated with specific surface area than with aerodynamic diameter. DOE

N83-14909# Brookhaven National Lab., Upton, N. Y. Biology Dept.
ULTRAVIOLET-LIGHT-INDUCED TRANSFORMATION OF HUMAN PRIMARY CELLS
Betsy M. Sutherland 1981 20 p refs Presented at the NATO CNEN Conf., Rome, 24 Aug. - 5 Sep. 1981
(Contract DE-AC02-76CH-00016)
(DE82-002250; BNL-30102; CONF-810873-3) Avail: NTIS HC A02/MF A01

The development of model systems for probing the ultraviolet radiation induced oncogenic transformation of human skin cells is described. DOE

N83-14910# Oak Ridge National Lab., Tenn.
ESTIMATES OF HEALTH RISK FROM EXPOSURE TO RADIOACTIVE POLLUTANTS
R. E. Sullivan, N. S. Nelson, W. H. Ellett, D. E. Dunning, Jr., R. W. Leggett, M. G. Yalcintas, and K. F. Eckerman Nov. 1981 65 p refs
(Contract W-7405-eng-26)
(DE82-002486; ORNL/TM-7745) Avail: NTIS HC A04/MF A01

A dosimetric and health effects analysis has been performed for the Office of Radiation Programs of the Environmental Protection Agency (EPA) to assess potential hazards from radioactive pollutants. Contemporary dosimetric methods were used to obtain estimates of dose rates to reference organs from internal exposures due to either inhalation of contaminated air or ingestion of contaminated foods, or from external exposures due to either immersion in contaminated air or proximity to contaminated ground surfaces. These dose rates were then used to estimate the number of premature cancer deaths arising from such exposures and the corresponding number of years of life lost in a cohort of 100,000 persons, all simultaneously liveborn and all going through life with the same risks of dying from compeling causes. The risk of dying from a competing cause for a given year was taken to be the probability of dying from all causes as given in a recent actuarial life table for the total US population. DOE

N83-14911# Research Inst. of National Defence, Stockholm (Sweden).
FACTOR ANALYTICAL DESCRIPTION OF NIGHT VISION TESTS
Lars Persson, Hans Leyon, and Hans Marmolin Aug. 1982 24 p refs
(FOA-C-53008-H2) Avail: NTIS HC A02/MF A01

Human night vision capacity is described by interindividual correlations between different night vision tests. A component analysis showed that four independant factors explained 74% of the total variance: light sensitivity, contrast sensitivity, dark adaptation, and glare recovery. The high reliability and validity figures obtained point to the possibility of predicting night vision performance on the basis of these factors. Author (ESA)

N83-14912# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
DETECTION OF TRENDS IN LONG TERM RECORDINGS OF CARDIOVASCULAR SIGNALS
Niilo Saranummi (Technical Research Centre of Finland, Tampere) Apr. 1982 142 p refs
(EUT-82-E-125; ISBN-90-6144-125-0) Avail: NTIS HC A07/MF A01

Trend detection algorithms in cardiovascular signals are studied and compared with each other in order to select a trend detection procedure. Proposed methods include the exponentially mapped past filter (EMP) which is very simple to implement and reliable but has a rather slow response. A second degree Kalman filter which is also simple to implement is investigated throroughly. It is better than EMP filters since it can be tuned to the statistics of the signal and the measurements. A best choice for a trend detector that is able to operate in the presence of measurement errors is described as a combination of an EMP Filter, a second order Kalman filter to estimate the first derivative of the signal and a statistical test to assess the skewing of the first derivative from zero. Author (ESA)

N83-14913# Centre Technique des Industries Mecaniques, Senlis (France).
MOIRE EFFECT CELLS. INTRODUCTION TO A PHYSIOLOGICAL EFFECT AND EXPLOITATION OF SLOTTED INTEGRATORS Final Report [CELLULES A EFFET DE MOIRE. INTRODUCTION D'UNE APPROCHE PHYSIOLOGIQUE ET EXPLOITATION PAR DES INTEGRATEURS A FENTES]
M. Paraskevas May 1982 36 p refs In FRENCH
(CETIM-15-G-061) Avail: NTIS HC A03/MF A01

Starting from a psychophysiological analysis of the Moire effect, a mathematical model of the light intensity transmitted by two systems of parallel bars crossing each other at a given angle is described, and the possibility of integration by optical measurement using one or more rectangular opening diaphragms is demonstrated. Experimental measurements confirm the theoretical model. The technique allows the determination of the angle between both networks with an accuracy of 1 arcmin and the polar coordinates of the rotation center with an accuracy of 0.5 mm. Author (ESA)

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N83-14914# Wisconsin Univ., Madison. Motor Behavior Lab.
CODING, ORGANIZATION AND FEEDBACK VARIABLES IN MOTOR SKILLS Final Report
George E. Stelmach Apr. 1982 517 p refs
(Grant AF-AFOSR-3691-78; AF Proj. 2313)
(AD-A118575; Rept-10; AFOSR-82-0620TR) Avail: NTIS HC A22/MF A01 CSCL 05/10

The major theoretical accomplishment of this research effort is the application of organizational concepts derived from control theory to models of motor control. Experimental results of this effort include: (1) a demonstration that there is genuine interactivity of two limbs under a number of bimanual conditions, (2) evidence that rapid error corrections are dependent on efference rather than on afferent input indicating the existence of internal feedback that monitors efferent commands, (3) descriptions of spatial orientations within egocentric space, and (4) specification of the role of organizational processes in motor learning and control.
Author (GRA)

N83-14915# Perceptronics, Inc., Woodland Hills, Calif.
MENTAL REPRESENTATION OF CIRCUIT DIAGRAMS: INDIVIDUAL DIFFERENCES IN STRUCTURAL KNOWLEDGE
Thomas D. Wickens, Ralph E. Geiselman, Michael G. Samet, and Cynthia L. Yelvington Jun. 1982 54 p refs
(Contract N00014-81-C-0590)
(AD-A119171; PATR-1109-82-6) Avail: NTIS HC A04/MF A01 CSCL 05/10

The knowledge of electronics technicians of electronic equipment, and how people operate in tasks that draw upon a complex spatial symbolic knowledge base is considered. A technician's knowledge base is postulated to consist of three types of related knowledge: (1) structural/functional knowledge, (2) prototypical knowledge, and (3) procedural knowledge. The first of these knowledge types, structural/functional knowledge, was studied in an experiment in which subjects were asked to reconstruct circuits and to partition circuits into components. Dramatic performance differences, in terms of errors and speed, were found between technicians of varying skill levels. However, any between group differences in the derived representatons of the structural/functional knowledge base were dwarfed by individual differences in the patterns of reconstruction and partitioning performance. It is anticipated that more fundamental differences among technicians of varying skill levels lie in their respective procedural knowledge. The results of this research program should help in providing guidelines for training electronic technicians to better understand and troubleshoot complex equipment. GRA

N83-14916# Boston Univ., Mass. Center for Adaptive Systems.
THE QUANTIZED GEOMETRY OF VISUAL SPACE: THE COHERENT COMPUTATION OF DEPTH, FORM AND LIGHTNESS, REVISED VERSION Interim Report
Stephen Grossberg Aug. 1982 106 p refs
(Grants AF-AFOSR-0148-82; NSF IST-80-00257; AF Proj. 2313)
(AD-A119240; AFOSR-82-0713TR) Avail: NTIS HC A06/MF A01 CSCL 05/10

A theory is presented of how global visual interactions between depth, length lightness, and form percepts can occur. The theory suggests how quantized activity patterns which reflect these visual properties can coherently fill-in, or complete, visually ambiguous regions starting with visually informative data features. Phenomena such as the Cornsweet and Craik-O'Brien effects, phantoms and subjective contours, binocular brightness summation, the equidistance tendency, Emmert's law, allelotropia, multiple spatial frequency scaling and edge detection, figure-ground completion, co-existence of depth and binocular rivalry, reflectance rivalry, Fechner's paradox, decrease of threshold contrast with increased number of cycles in a grating pattern, hysteresis, adaption level tuning, Weber law modulation, shift of sensitivity with background luminance, and the finite capacity of visual short term memory are discussed in terms of a small set of concepts and mechanisms. Limitations of alternative visual theories which depend on Fourier analysis, Laplacians, zero-crossings, and cooperative depth planes are described. Relationships between monocular and binocular processing of the same visual patterns are noted, and a shift in emphasis from edge and disparity computations towards the characterization of resonant activity-scaling correlations across multiple spatial scales is recommended. Author (GRA)

N83-14917# Arizona State Univ., Tempe. Dept. of Psychology.
PHYSIOLOGICAL AND DUAL TASK ASSESSMENT OF WORKLOAD DURING TRACKING AND SIMULATED FLIGHT Final Report
Ernest Lindholm, Cary Cheatham, and George Buckland Jan. 1981 78 p refs
(Contract F49620-79-C-0197; AF Proj. 2313)
(AD-A119218; AFOSR-82-0714TR) Avail: NTIS HC A05/MF A01 CSCL 05/10

A visuomotor task of moderate complexity (tracking) and one of high complexity (simulated aircraft carrier landing) were performed alone, then in combination with a tone discrimination task at two levels of difficulty in usual dual task fashion. Measures of autonomic nervous system activation (heart rate, skin conductance) and central nervous system information processing (event related potentials) were quantified continuously during performance of all tasks. The dual task results were typical, given that most subjects treated the tone discrimination task as 'secondary' (low priority): tone discrimination performance degraded when the tone mask was combined with the tracking task and degraded even more when the tone task was combined with the carrier landing task. While dual task methodology adequately described gross changes in workload, the physiological data permitted much more detailed interpretations and descriptions of training effects (practice), tone mask information processing, individual differences, and viscuomotor task control parameters than was possible by analysis of secondary task performance. It is concluded that the physiological method has distinct advantages over the dual task method, due mostly to the nonintrusive nature and the greater detail of results afforded by the former method. Author (GRA)

N83-14918# Naval Aerospace Medical Research Lab., Pensacola, Fla.
MULTIPLEX CONTROLLER APTITUDE TEST AND OCCUPATIONAL KNOWLEDGE TEST: SELECTION TOOLS FOR AIR TRAFFIC CONTROLLERS
Micheal G. Lilienthal and Frank S. Pettyjohn 15 Dec. 1981 116 p refs
(Contract DTFA01-80-Y-30528)
(AD-A118803; NAMRL-SR-82-1) Avail: NTIS HC A06/MF A01 CSCL 05/9

The cost of training Air Traffic Control (ATC) personnel has risen rapidly. Attrition of students prior to completion of the training results in loss of invested funds as well as a delay in providing a fully qualified ATC specialist to the field for both military and civilian agencies. Improved selection and prediction tests for ATC personnel have been recognized as essential to decrease attrition rates. This study examined the selection utility of the Federal Aviation Administration (FAA) prototype ATC test battery. The test protocol consisted of the Multiplex Controller Aptitiude Test (MCAT), a job simulation test; and the Occupational Knowledge Test (OKT), a job knowledge specific test. Two-thousand four-hundred ninety-nine FAA/ATC Academy trainees from the 1978 through 1980 period had taken two versions of the Multiplex Controller Aptitude Test (MCAT1) and MCAT2) and one version of the Occupational Knowledge Test (OKT). Test scores for 1,954 of these subjects were merged with information concerning their sex, education, ATC experience, ATC option, and pass/fail status at the ATC Academy. Item analyses indicated the MCAT contained very difficult or very easy items in over 50 percent of the test questions. The OKT had acceptable levels of item difficulty at the 25 percent level. GRA

N83-14919# Logicon, Inc., San Pedro, Calif. Tactical and Training Systems Div.
PROTOTYPE CONFIGURATION REPORT FOR AIR INTERCEPT CONTROLLER PROTOTYPE TRAINING SYSTEM Final Report, 28 Sep. 1978 - 11 Feb. 1980
Ronald D. Granberry, Robin Halley, and Michael R. King Jul. 1982 57 p
(Contract N61339-78-C-0182)
(AD-A118750; Rept-8641-A00C; NAVTRAEQUIPC-78-C-0182-6) Avail: NTIS HC A04/MF A01 CSCL 05/9

This report delineates the design criteria and human engineering principles and practices to be applied in the design and general arrangements of the ACE Prototype Training System. The specifics for site preparation, detailed floor plans and environmental requirements will be developed in the Prototype Facilities Report to follow. Author (GRA)

N83-14920# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
COGNITIVE PERFORMANCE DURING LONG-DURATION VIBRATION
Richard W. Shoenberger and C. Stanley Harris Jul. 1982 14 p refs
(AF Proj. 7231)
(AD-A118612; AFAMRL-TR-81-57) Avail: NTIS HC A02/MF A01 CSCL 05/10

To evaluate the effects of vibration exposure duration on cognitive performance, the performance of 16 subjects was measured on a Complex Counting Task (CCT) and a reading task during a three-hour exposure to each of two whole-body vibration conditions. Quasi-random vibrations with frequencies from 2.6 through 16 Hz were presented at two intensities, 0.164 R.M.S. Gz and 0.03 R.M.S. Gz. During each of the two three-hour sessions the subjects performed the reading task for the first 45 minutes of each hour, and the CCT for the last 15 minutes of each hour. Performance on the CCT showed no effect of exposure duration; however, the reading task did provide evidence of such an effect. For the reading task, the high-level vibration condition showed a relative decrement in the amount read that increased with exposure duration. During low-level vibration there was a significant increase in reading rate that did not occur during high-level vibration.
Author

N83-14921# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
EXPERIMENTAL AND THEORETICAL ANALYSIS OF HUMAN MONITORING AND DECISION MAKING BEHAVIOR IN FAILURE DETECTION TASKS
R. C. vandeGraaft and P. H. Wewrinke 11 May 1981 18 p refs Presented at 1st European Ann. Conf. on Human Decision Making and Manual Control, Delft, May 25-27, 1981 Revised
(NLR-MP-81032-U) Avail: NTIS HC A02/MF A01

An experimental program designed to validate a model of the human observer and decision maker, formulated in terms of linear estimation and classical sequental decision theory is described. The experiment included monitoring tasks in which the occurrence of ramp failures which were superimposed upon zero-mean stochastic Gaussian processes had to be detected. The independent variables were signal bandwidth, correlation among displays, number of displays, failure rate, failure type, and prior knowledge about failure type. The dependent variables were response times, display deviations at the moments of response, and false alarm rates. Heart rate, skin resistance, and eye point of regard were measured. Good overall agreement between the experimental results and the model predictions is found.
Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N83-14922 Stanford Univ., Calif.
MOTION SEQUENCING OF MANIPULATORS Ph.D. Thesis
Mohamed Shahid Mujtaba 1982 306 p
Avail: Univ. Microfilms Order No. DA8220511

Experience in using manipulators was gained by programming the assembly of flashlights, lawn sprinklers and other objects using AL, an interactive programming language for robots. Analysis of the programs disclosed commonly repeated sequences of operations. Examination of industrial engineering techniques revealed that the Methods Time Measurement (MTM) system was an extensive body of knowledge for analyzing human motions while performing various tasks. Many sequences of operations in programming mechanical arms were found in MTM. Motion Sequencing of Manipulators (MSM) for describing and specifying operations for mechanical arms was proposed after analyzing mechanical assembly programs and studying MTM. The MSM procedure was implemented in AL and evaluated by various people familiar with industrial engineering and manipulator programming languages. They concluded that MSM is more succinct, simpler and has fewer commands than AL. Dissert. Abstr.

N83-14923# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
EFFECTS OF NON-PREFERRED HAND ON CONTROL MOVEMENT STEREOTYPES M.S. Thesis - Texas A and M Univ.
Richard Lee Lenz 1982 74 p refs
(AD-A118976; AFIT/CI/NR/82-32T) Avail: NTIS HC A04/MF A01 CSCL 05/10

A laboratory study was conducted to establish the degree to which ON-OFF control movement stereotypes apply to the non-preferred hand as well as to the preferred hand and both hands acting in unison. The subjects were 120 Air Force ROTC students at Texas A&M University. Thirty of these subjects were left-handed. Twenty of the subjects performed under each of the six conditions with 5 left-handed in each group. A criterion score for stereotyped performance was set at 85 percent and Z-tests were conducted to establish significance. Data showed strong stereotypes for turning off switches, but showed no corresponding stereotypes for turning on switches. Left-right toggles showed no stereotype for either hand. Use of the non-preferred hand showed consistently lower percentages in the expected direction but the differences were not statistically significant. When both hands were used together, opposing movements predominated for left-right and rotary switches. Horizontally mounted toggle switches were pulled rearward for both on and off under all conditions. GRA

N83-14924# Naval Ocean Systems Center, San Diego, Calif.
WORK SYSTEMS PACKAGE AUTOMATIC TOOL INTERCHANGE. LABORATORY STUDY SHOWS THAT AUTOMATING CERTAIN WSP FUNCTIONS IS FEASIBLE Final Report, Oct. 1977 - Jun. 1978
C. E. Morrin 10 Jun. 1982 120 p refs
(AD-A119327; NOSC/TR-262) Avail: NTIS HC A06/MF A01 CSCL 13/10

The Work Systems Package (WSP) is a remotely controlled manipulator with tools and support equipment, developed to interface with manned and unmanned undersea vehicles to perform ocean-floor salvage, recovery, installation, and repair tasks. Since bottom time is limited, risk factors are high, and visibility often is poor or hampered, automation of certain WSP functions would take advantage of the limited available power and reduce the risk factor. Automating the WSP via a computer program allows the WSP accessories (e.g., tool box and tools) to be moved out of the prime visibility area of a manned vehicle and helps the operator to perform tasks faster and more efficiently. Author (GRA)

N83-14925# Cornell Univ., Ithaca, N. Y. Dept. of Computer Science.
ON THE MOVEMENT OF ROBOT ARMS IN 2-DIMENSIONAL BOUNDED REGIONS
John E. Hopcroft, Deborah A. Joseph, and Sue H. Whitesides Mar. 1982 34 p refs
(Contract N00014-76-C-0018; Grant NSF MCS-81-01220)
(AD-A119507; CU-CSD-TR-82-486) Avail: NTIS HC A03/MF A01 CSCL 12/1

The classical mover's problem is the following: can a rigid object in 3-dimensional space be moved from one given position to another while avoiding obstacles? It is known that a more general version of this problem involving objects with movable joints is PSPACE complete, even for a simple tree-like structure moving in a 3-dimensional region. In this paper, we investigate a 2-dimensional mover's problem in which the object is a robot arm with an arbitrary number of joints. In particular, we give a polynomial time algorithm for moving an arm confined within a circle from one given configuration to another. We also give a polynomial time algorithm for moving the arm from its initial position to a position in which the end of the arm reaches a given point within the circle. Author (GRA)

N83-14926# Navy Clothing and Textile Research Facility, Natick, Mass.
THE LIQUID-AIR SYSTEM AND THE DRY-ICE COOLING SYSTEM: A FIELD TEST OF THE COOLING CAPABILITIES OF 2 LIFE-SUPPORT-SUIT ASSEMBLIES Final Report, Aug 1980 - Jul. 1981
Arthur H. Chadwick, James C. Shampine, Robert A. Keene, and Joseph W. Giblo Jul. 1982 34 p
(AD-A118650; NCTRF-144) Avail: NTIS HC A03/MF A01 CSCL 06/11

The Navy Clothing and Textile Research Facility (NCTRF) conducted a field evaluation to compare two life-support-suit assemblies. One assembly was a liquid-air-cooled suit that provided convective cooling; the other was a dry-ice system that used liquid-cooled underwear to provide conductive cooling. The test results indicated the dry-ice system was preferred by 74.2% of the test subjects for cooling purposes. Author (GRA)

N83-14927# Research Inst. of National Defence, Stockholm (Sweden).
THE ROLE OF BIOTECHNOLOGY IN TECHNICAL SYSTEM DEVELOPMENT: SOME PROBLEMS [BIOTEKNOLOGINS ROLL VID TEKNISK SYSTEMUTVECKLING: NAAGRA PROBLEM]
Hans Furustig Feb. 1982 59 p refs In SWEDISH
(FOA-C-56029-H2) Avail: NTIS HC A04/MF A01

Problems related to the nature, development, and use of human factors engineering are considered and system development techniques are analyzed. The criterion question in human factors/biotechnology applications and information dissemination are discussed. Criteria are, e.g., applicability, credibility, communication feasibility. Human factors engineering considerations which are often underrated include ethical, design, and cultural preferences. Author (ESA)

N83-14928# Centre Technique des Industries Mecaniques, Senlis (France).
A TEST BENCH FOR TRACTOR SEATS Final Report [BANC D'ESSAI DE SIEGES DE TRACTEURS]
J. P. Deville Mar. 1982 73 p refs In FRENCH
(CETIM-15-K-421) Avail: NTIS HC A04/MF A01

A test bench for tractor seats, a vibration generation system and signal analysis procedure which provide fast and economical quality evaluation were developed. A test bench design corresponding to European norms is described. The characteristics of the vibration simulator are discussed, showing that it must produce vertical and horizontal vibrations under electrohydraulic control with an amplitude of at least 7,5 cm at 2 Hz frequency. The implementation of the vibration system is described. The vibration is measured by two low frequency accelerometers and the resulting acceleration signals are weighted by a curve representing the human tolerance to vibration. Computations are performed with the aid of an HP 5451 B computer. Author (ESA)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N83-14929*# Raytheon Co., Sudbury, Mass.
CARE 3 PHASE 2 REPORT - MATHEMATICAL DESCRIPTION
J. J. Stiffler and L. A. Bryant Washington NASA Nov. 1982 61 p refs
(Contract NAS1-15072)
(NASA-CR-3566; NAS 1.26:3566) Avail: NTIS HC A04/MF A01 CSCL 14D

CARE III (Computer-Aided Reliability Estimation, version three) a computer program designed to help estimate the reliability of complex, redundant systems is described. Although the program can model a wide variety of redundant structures, it was developed specifically for fault tolerant avionics systems. CARE III generalizes the class of system structures that can be modeled and greatly expands the coverage model to take into account such effects as intermittent and transient faults, latent faults, and error propagation. R.J.F.

N83-14930# Army Research Office, Research Triangle Park, N. C.
PROCEEDINGS OF THE 1982 ARMY NUMERICAL ANALYSIS AND COMPUTERS CONFERENCE Interim Technical Report
Aug. 1982 620 p refs Conf. held in Vicksburg, Miss., 3-4 Feb. 1982; sponsored by the Army Mathematics Steering Committee
(AD-A118920; ARO-82-3) Avail: NTIS HC A99/MF A01 CSCL 12/1

Grid techniques for partial differential equations are addressed. For individual titles, see N83-14931 through N83-14950.

N83-14931# Mississippi State Univ., Mississippi State. Dept. of Aerospace Engineering.
WESCOR, BOUNDARY-FITTED COORDINATE CODE FOR GENERAL 2D REGIONS WITH OBSTACLES AND BOUNDARY INTRUSIONS **c64**
Joe F. Thompson *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 1-76 refs (For primary document see N83-14930 05-59)
(Contract DACW39-78-C-0054)
Avail: NTIS HC A99/MF A01 CSCL 12/1

A code for the generation of boundary-fitted coordinate systems for general 2D regions with boundaries of arbitrary shape and with internal obstacles and boundary intrusions, arbitrary in shape and number, is described and instructions for input and use are given. The coordinate system is generated from the numerical solution of a system of elliptic partial differential equations with provision for controlling the spacing of the coordinate lines in the field. The transformed (computational) region is rectangular with the obstacles and intrusions transformed to slits and/or slabs. A small code to distribute points on various fundamental curves with exponential concentration is also described. This front-end code can be used to construct boundary point distributions for input to the coordinate code. A plot code for the coordinate system is also included. The boundary-fitted coordinate systems generated by this code may be used as a basis for the numerical solution of

partial differential equations for any physical problem of interest.
Author

N83-14932# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
FLUX-CORRECTED TRANSPORT IN AN EXPONENTIALLY STRETCHED GRID **c64**
Richard A. Schmalz, Jr. *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 77-98 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

The transport of a passive constituent in a tidal (oscillatory) flow regime is approximated using a Flux-Corrected Transport (FCT) technique over an exponentially stretched grid. The FCT technique consists of a nonlinear average of the results obtained from two schemes: a lower order in space nonoscillatory scheme, and a higher order in space scheme. The FCT method studied in this research employed a forward time upwind space (FTUS) scheme as the lower order nonoscillatory scheme and a forward time centered space (FTCS) scheme as the higher order scheme. Both schemes were implemented through an Alternating Direction Implicit (ADI) method employing the Thomas algorithm for matrix inversion. Numerical results are obtained on a 6785 cell exponentially stretched grid employed to represent circulation in Mississippi Sound for the FTUS, FTCS, and FCT schemes. Comparison of these results demonstrates the magnitude of the differences for constituent transport obtained from these alternate numerical approaches on a real world problem size computational grid.
Author

N83-14933# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Launch and Flight Div.
GRID GENERATION TECHNIQUES FOR PROJECTILE CONFIGURATIONS **c02**
Charles J. Nietubicz, Karen R. Heavey, and Joseph L. Steger (Stanford Univ., Palo Alto, Calif.) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 99-122 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 01/2

A versatile grid generation program developed for standard, hollow and non-axisymmetric projectile shapes is described. The grid generator makes use of both elliptic and hyperbolic type partial differential equation solvers. The code allows arbitrary grid point clustering along the body surface in areas of anticipated flow field gradients. The outer boundary can also be arbitrarily defined with its own clustering distribution. The grid is then generated between these two boundaries with either straight rays or by use of an elliptic solver. For those cases when the outer boundary is not restricted, the grid can be generated using a hyperbolic solver which adds the additional benefit of an orthogonal mesh. The mathematical development of the clustering functions and partial differential equation solvers are described and a series of grids are presented which show the versatility of the grid generation program. Grids for ogive-cylinder-boattail configurations, hollow ring airfoil projectiles and non-axisymmetric projectiles are discussed.
Author

N83-14934# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
APPLICATION OF RELATIVE COORDINATES IN HYDRODYNAMICS **c43**
R. H. Multer *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 123-136 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08/8

A method for approximating the solution of the exact hydrodynamic wave problem is presented.
Author

N83-14935# Rockefeller Univ., New York. Dept. of Mathematics.
A GENERALIZED RANDOM CHOICE METHOD FOR GAS DYNAMICS **c34**
James Glimm, Guillermo Marshall, and Bradley Plohr *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 137-148 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 20/4

A generalization of the Riemann problem for gas dynamical flows influenced by curved geometry, such as flows in a variable-area duct is solved. For this generalized Riemann problem the initial data consists of a pair of steady-state solutions separated by a jump discontinuity. The solution of the generalized Riemann problem is used as a basis for a random choice method in which steady-state solutions are used as an Ansatz to approximate the spatial variation of the solution between grid points. For nearly steady flow in a Laval nozzle, where this Ansatz is appropriate, this generalized random choice method gives greatly improved results.
Author

N83-14936# Georgia Inst. of Tech., Atlanta. School of Mathematics.
FREE BOUNDARY PROBLEMS WITH NONLINEAR SOURCE TERMS **c64**
Gunter H. Meyer *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 245-251 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

Multi-dimensional free boundary problems with nonlinear reaction terms are proximated with a modified method of lines. An iterative numerical method results in which only one dimensional free boundary problems are solved sequentially. The algorithm is applied to an obstacle problem, a Michaelis-Menten reaction problem and a two component second order reaction problem.
Author

N83-14937# Army Armament Research and Development Command, Dover, N. J. Fire Control and Small Caliber Weapon Systems Lab.
NUMERICAL RESULTS OF TRANSIENT TWO-DIMENSIONAL HEAT CONDUCTION **c34**
R. Yalmanachili *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 293-304 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 20/4

A general expression is chosen, based on a prior research, for a transient two-dimensional heat conduction. The objective is to choose a variety for Laplacien term, both implicit and explicit finite - differences, and finite - element results. This is programmed in FORTRAN IV for a digital computer solution. The transient temperatures are predicted due to a step change in boundary conditions for a two-dimensional plate. The midpoint temperatures are discussed in detail where the influence of boundary conditions are minimum. The results are predicted for four Laplacian (different) approximations, explicit, Crank - Nicholson and standard implicit finite - differences and finite - element approaches.
Author

N83-14938# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
SALOME, A STRUCTURED AND LOGICALLY MINIMAL ENSEMBLE **c61**
Royce W. Soanes, Jr. *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 305-322 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 09/2

An overview of the SALOME structured programming language is given, along with its syntax and semantics. SALOME has been designed with the FORTRAN programmer in mind. The SALOME source language is supported by a translator having a target language of standard FORTRAN, and FORTRAN code may be injected into SALOME source code when needed. The SALOME translator has been written in SALOME and FORTRAN.
Author

N83-14939# Wisconsin Univ., Madison. Mathematics Research Center.
ACCURATE COMPUTER ARITHMETIC FOR SCIENTIFIC COMPUTATION **c64**

L. B. Rall *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 343-356 refs (For primary document see N83-14930 05-59)
(Contract DAAG29-80-C-0041)
Avail: NTIS HC A99/MF A01 CSCL 12/1

The operations of accurae arithmetic can be implemented easily on a microcomputer or a computer with microprogrammable arithmetic operations. In addition, for accurate final results, a compiler is necessary which will select the appropriate operations. A language of this type (PASCAL-SC) was developed. Along with accurate real arithmetic, this compiler provides accurate complex arithmetic, real and complex interval arithmetic, and vector and matrix arithmetic over these data types. Some features of PASCAL-SC related to scientific and engineering computation are described. In most cases, the operations of accurate arithmetic are performed at the same speed as ordinary (uncontrolled) floating-point arithmetic. Author

N83-14940# Naval Surface Weapons Center, Dahlgren, Va.
MATHEMATICAL SOFTWARE AND MATHEMATICAL SOFTWARE LIBRARIES c61
Alfred H. Morris, Jr. *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 357-364 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 09/2

A brief summary of the evolution of general purpose mathematical software development is given. The NSWC library is then introduced, and sources of high-quality numerical mathematical software are provided. Author

N83-14941# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
ADI PROCEDURES FOR SOLVING THE SHALLOW-WATER EQUATIONS IN TRANSFORMED COORDINATES c48
H. L. Butler and Y. P. Sheng (Aeronautical Research Associates of Princeton, Inc.) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 365-381 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08C

The mathematical development of a two dimensional finite difference and the treatment of the external mode of a three dimensional model to study the dynamic response of coastal water to tides are discussed. For model efficiency alternating direction implicit (ADI) procedures are used to solve the vertically integrated equations of momentum and continuity for the two dimensional model as well as for the external mode of the three dimensional model. A major advantage of the subject models is the capability of applying a horizontal coordinate transformation in the form of a piecewise exponential stretch. This procedure results in the application of a smoothly varying grid to a given study region permitting simulation of a complex landscape by locally increasing grid resolution and/or aligning grid coordinates along physical boundaries. E.A.K.

N83-14942# General Electric Co., Fairfield, Conn. Electronics Systems Programs Operation.
AN INTEGRAL EQUATION FOR THE DESIGN OF MAGNETIC FIELD COILS c33
J. F. Schenck, M. A. Hussain, W. A. Edelstein, and B. Noble (Wisconsin Univ., Madison) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 397-414 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 09/3

The use of the calculus of variations to design magnet coils that have a minimum stored energy was investigated. The problem of computing the winding density along a cylindrical surface that will minimize the stored energy, while at the same time produce a magnetic field with certain desired characteristics is considered. These desired characteristics are prescribed as constraints on various coefficients in the spherical harmonic expansion of the magnetic field. They are introduced into the minimization problem by the use of Lagrange multipliers. E.A.K.

N83-14943# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
ELEMENT TYPE COMPARISON IN BASIN OSCILLATION ANALYSIS c34
Mark D. Prater and Keith W. Bedford (Ohio State Univ., Columbus) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 415-428 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 20/4

Finite element types in the solution of basin oscillations were compared. A two dimensional finite model is used to obtain a harmonic solution to the linearized velocity potential formulation of the shallow water wave equation. The influence of three types of elements, linear triangles (LT), linear isoparametric quadrilaterals (LIQ), and quadratic isoparametric quadrilaterals (QIQ) on the computation of periods of oscillation and normalized displacement fields of basins is tested. The solution technique and the results and conclusions of two model applications are described. The first employs a rectangular basin with uniform depth and the second a natural basin, Lake Erie, with varied geometry and bathymetry. E.A.K.

N83-14944# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
A TSUNAMI GENERATION AND PROPAGATION MODEL DRIVEN BY VERTICAL SEABED MOVEMENTS c48
Jeff Earickson *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 429-456 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08/3

The generation and propagation of tsunamis by vertical motions of an impermeable seabed was examined in one dimension. Perturbation techniques are used to solve the general equations of fluid motion, and the resulting two nonlinear differential equations describe the effects of seabed motion on the fluid. Near and far field wave forms are computed from a finite difference approximation (FDA) of the differential equations to show possible generation and propagation modes of tsunamis. The FDA is verified by examining the problems of a solitary wave moving in a uniform depth of fluid, and a solitary wave shoaling upon a plane beach. It is shown that the FDA gives uniformly valid results in both the generation region and in the far field. E.A.K.

N83-14945# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
THEORY AND CALCULATION OF THE NON-LINEAR ENERGY TRANSFER BETWEEN SEA WAVES IN DEEP WATER c48
Barbara A. Tracy and Donald T. Resio (Oceanweather, Inc.) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 457-476 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08/3

Nonlinear coupling between sea waves results when the continuity equation is solved using a free surface for boundary conditions. Hasselmann was able to provide a solution to these equations by a perturbation of the linear solution since the nonlinear coupling is weak. Hasselmann assumed a Gaussian sea and set up a solution which could be analyzed by looking at the Boltzmann integral for dn/dt. Webb's technique is used to solve the energy transfer Boltzmann integrals and how this integration process can be made simpler and more efficient by the utilization of a geometrically spaced polar grid over the spectral region is demonstrated. This grid allows the loci and the coefficients inside the integrand to scale by various multiples of the geometric scaling factor. Numerical results for the nonlinear energy transfer are given for various spectra. M.G.

N83-14946# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
CONSTRAINED AND UNCONSTRAINED VARIATIONAL FINITE ELEMENT FORMULATION OF SOLUTIONS TO A STRESS WAVE PROBLEM, A NUMERICAL COMPARISON c64
Julian J. Wu and C. N. Shen *In* Army Research Office Proc. of

the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 477-498 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

The solution formulation and finite element discretization of a stress wave problem with discontinuous data in two variational schemes is presented. The first is in a sense a generalized Galerkin's approach in that it works for nonself adjoint problem and that all the end conditions are made to be natural ones and hence none of them are required to be satisfied by the trial functions. The second is an adjoint bilinear variational principle developed for initial and initial/boundary value problems which requires that initial conditions be satisfied exactly and the variations of the adjoint variable be set to vanish. It is consequently a constrained variational formulation. The numerical results of these two variational formulations are compared for the case of a stress wave problem in a uniform bar. M.G.

N83-14947# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
NUMERICAL SOLUTIONS USING ADJOINT VARIATIONAL FORMULATION TO STRESS WAVE PROBLEMS c64
C. N. Shen and Julian J. Wu *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 499-516 ref (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

The numerical implementation of an adjoint variational principle in conjunction with cubic Hermite polynomials as the approximate functions for the solution of mixed initial boundary value problems is discussed. The specific example used for numerical results is the longitudinal stress wave of a uniform bar. First, the adjoint principle associated with this problem is stated. It is followed by the discretized counterparts in spatial and temporal dimensions. The procedures involving the assemblage of the mass and stiffness matrices in the two dimensions are described. Due to the null variations of some adjoint variables, certain rows of the matrices are eliminated. Because certain variables are known at the boundaries, the unknown variables for the next interval of time can be computed by inversion of a band matrix in terms of their present values. M.G.

N83-14948# Aeronautical Research Associates of Princeton, Inc., N. J.
A THREE-DIMENSIONAL NUMERICAL MODEL OF COASTAL, ESTUARINE AND LAKE CURRENTS c48
Y. P. Sheng and H. L. Butler (Army Engineer Waterways Experiment Station) *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 531-574 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 08/3

A mathematical model capable of simulating the three dimensional, time dependent currents in coastal, estuaries, and lake waters is presented. Special computational features included in the model are: (1) a time splitting technique which separates the computation of the slowly varying internal mode (three dimensional variables) from the computation of the fast varying external mode (water level and vertically integrated velocities); (2) an ADI algorithm for the computation of the external mode; (3) an implicit algorithm for the vertical diffusion terms of the internal mode equations; (4) a vertically stretched coordinate that allows the same order of accuracy in the vertical direction at all horizontal locations; (5) an algebraically stretched grid in the horizontal directions. These computational features lead to an efficient and versatile three dimensional model suitable for long term simulations. Physical aspects of the model are also discussed. Applications of the model to simulate laboratory flow, tidal currents in an open bight where an analytical solution is available, wind driven lake currents, and tide driven and wind driven coastal currents are also presented. M.G.

N83-14949# Iowa State Univ. of Science and Technology, Ames. Dept. of Aerospace Engineering.
SOLUTION ADAPTIVE GRIDS FOR PARTIAL DIFFERENTIAL EQUATIONS c64
Dale A. Anderson *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 575-592 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

Various techniques for constructing solution adaptive grids used in numerically solving partial differential equations are reviewed. These methods include those which directly determine the metrics or coordinates and schemes which postulate laws of point motion providing a direct calculation of the grid speed. Examples showing results obtained with each method are presented and suggestions for possible directions of future work are made. M.G.

N83-14950# Ecodynamics Research Associates, Inc., Albuquerque, N. Mex.
INTERACTIVE DESIGN OF LASER ELECTRODES USING ELLIPTIC GRID GENERATION AND SEMIDIRECT/MARCHING METHODS c36
Patrick J. Roache *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 593-603 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 20/5

A computational effort to develop computer codes for rapidly and accurately modeling the electric fields within laser cavities is described. Semidirect/marching methods are used both for the generation of two dimensional boundary fitted grids using the elliptic generating equation approach, and for the solution of electric field problems in those coordinate systems. The efficiency of the semidirect/marching methods makes possible interactive design of the laser electrodes using a modest computer. Also described are techniques for high order accuracy, a method for precise grid control at interior points, and applications to the elliptic grid generation problem of computer symbolic manipulation. M.G.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N83-14951# General Accounting Office, Washington, D. C. Mission Analysis and Systems Acquisition Div.
DOD INSTRUCTION 5000.5X, STANDARD INSTRUCTION SET ARCHITECTURES FOR EMBEDDED COMPUTERS
24 May 1982 21 p
(B-199008) Avail: NTIS HC A02/MF A01

Standard instruction set architectures for embedded computers are discussed. N.W.

N83-14952*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
VALIDATION OF MULTIPROCESSOR SYSTEMS Annual Report
Daniel P. Siewiorek, Zary Segall, and Thomas Kong 23 Dec. 1982 78 p refs
(Grant NAG1-190)
(NASA-CR-169667; NAS 1.26:169667) Avail: NTIS HC A05/MF A01 CSCL 09B

Experiments that can be used to validate fault free performance of multiprocessor systems in aerospace systems integrating flight controls and avionics are discussed. Engineering prototypes for two fault tolerant multiprocessors are tested. R.J.F.

N83-14953*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
MEMORY TECHNOLOGY SURVEY
13 Feb. 1981 77 p refs
(Contract NAS5-25599)
(NASA-CR-170450; NAS 1.26:170450; MDC-E2365) Avail: NTIS HC A05/MF A01 CSCL 09B

The current status of semiconductor, magnetic, and optical memory technologies is described. Projections based on these

research activities planned for the shot term are presented. Conceptual designs of specific memory buffer pplications employing bipola, CMOS, GaAs, and Magnetic Bubble devices are discussed. J.M.S.

N83-14954# Naval Research Lab., Washington, D. C.
INTERFACE SPECIFICATIONS FOR THE A-7E SHARED SERVICES MODULE
P. C. Clements 8 Sep. 1982 107 p refs
(AD-A118897; NRL-MR-4863) Avail: NTIS HC A06/MF A01 CSCL 09/2

This document describes the programmer interface to one of the modules in the Naval Research Laboratory's Software Cost Reduction (SCR) project, which is demonstrating the feasibility of applying advanced software engineering techniques to complex real-time systems in order to simplify maintenance. To illustrate the principles, the onboard software for the Navy's A-7E aircraft will be redesigned and rewritten. The Shared Services module provides those values and services that are used in the computation or derivation of output affecting more than one peripheral device in the system. The purpose of the Shared Services module is to allow the remainder of the software to remain unchanged when the requirements-based rules for these values and services change. This report describes the modular structure of the Shared Services module, and contains the abstract interface specifications for all of the facilities provided to users. It serves as development and maintenance documentation for the SCR software design, and is also intended as a model for other people interested in applying the abstract interface approach on other software projects.
Author (GRA)

N83-14955# Aeronautical Research Labs., Melbourne (Australia).
A FOUR-CHANNEL MULTIPLEXER FOR AN XYZ DISPLAY MONITOR
R. E. Selway May 1982 23 p refs
(AD-A118996; ARL-SYS-TECH-MEMO-59; AR-002-882) Avail: NTIS HC A02/MF A01 CSCL 09/2

A four-channel multiplexer was designed and built in early 1974 for the display of low-frequency voltages from an analog computer on a single gun XYZ display monitor. The salient features include the ability to display up to four sets of analog data as either X-Y or Y-T traces on any channel independently of other channels. The equipment has performed satisfactorily in service and is currently also used for the display of analog data generated by digital computer. Improvements in accuracy, speed, component count and reliability could be made with current (1982) technology, but refinements of this nature are not considered necessary. GRA

N83-14956# Army Missile Command, Redstone Arsenal, Ala. Systems Simulation and Development Directorate.
ADDITION OF DATA FEATURE FOR FEASIL
Maurice M. Hallum, III Jun. 1982 6 p Supersedes DRSMI/RD-81-16-TR; AD-A106992
(AD-A119329; AD-E950272; DRSMI/RD-82-18-TR; DRSMI/RD-81-16-TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report describes the feature to add data to the relational-based Data Management System, FEASIL, developed for the Interdata 8/32. The report describes the feature that provides the ability to add the data in a card image, formal free form.
Author (GRA)

N83-14957# Naval Research Lab., Washington, D. C.
CAMAC: A UNIQUE APPLICATION WITH A POCKET TERMINAL Final Report
A. D. Elmond 16 Sep. 1982 25 p
(AD-A119323; NRL-MR-4897) Avail: NTIS HC A02/MF A01 CSCL 09/2

Computer Automated Measurement and Control (CAMAC), IEEE's Standard 583, is being employed to upgrade a computer controlled, data collection and processing system in the Navy Space Program. This report describes an implementation of this standard for this project. A portable pocket terminal is used to perform standard operations of the CAMAC specifications.
Author (GRA)

N83-14958# Ohio State Univ., Columbus. Computer and Information Science Research Center.
THE IMPLEMENTATION OF A MULTI-BACKEND DATABASE SYSTEM (MDBS). PART 2: THE FIRST PROTOTYPE MDBS AND THE SOFTWARE ENGINEERING EXPERIENCE
Xingui He, Masanobu Higashida, David K. Hsiao, Douglas S. Kerr, Ali Orooji, Zong-Zhi Shi, and Paula Strawser Jul. 1982 159 p refs
(Contract N00014-75-C-0573)
(AD-A119161; NPS52-82-008) Avail: NTIS HC A08/MF A01 CSCL 09/2

The Multi-Backend Database System, MDBS, uses one microcomputer as the master or controller, and a varying number of microcomputers as slaves or backends. No special hardware is required. The backends are configured in a parallel manner. A new backend may be added by replicating the existing software on an addition minicomputer. A prototype MDBS is implemented to carry out design verification and performance evaluation studies. The MDBS implementation is described. The overall design and implementation of MDBS is given. The controller and the backends functions are described. A program to generate test data and a program to generate test requests are required. Our goal is not limited to the production of a prototype MDBS, but it is also aimed toward the applicaton of software engineering techniques to the development of the system. The software engineering techniques which are used are discussed. Designs for the controller subsystem, one of the two modules in the backends subsystem and the test request generation module are detailed. (GRA)

N83-14959# SysteCon, Inc., Norcross, Ga. Production and Distribution Research Center.
TRAVEL TIME MODELS FOR AUTOMATED STORAGE/RETRIEVAL SYSTEMS
Yavuz A. Bozer and John A. White (Georgia Inst. of Technology) May 1982 41 p refs
(Contract N00014-80-K-0709)
(AD-A119463; PDRC-82-06) Avail: NTIS HC A03/MF A01 CSCL 09/2

Travel time models are developed for automated storage/retrieval (AS/R) machines. The S/r machine travels simultaneously horizontally and vertically as it moves along a storage aisle. For randomized storage conditions expected travel times are determined for both single and dual command cycles. Alternative input/output (I/O) locations are considered. Additionally, various dwell point strategies for the storage/retrieval machine are examined. Author (GRA)

N83-14960# Stanford Univ., Calif. Dept. of Computer Science.
OPTIMAL FONT CACHING
David R. Fuchs and Donald E. Knuth Mar. 1982 20 p refs
(Contract N00014-81-K-0269; Grants NSF IST-79-21977; NSF MCS-77-23728)
(AD-A119439; SU-STAN-CS-82-901) Avail: NTIS HC A02/MF A01 CSCL 09/2

An efficient algorithm is presented for communicating letter-shape information from a high-speed computer with a large memory to a typesetting device that has limited memory. The encoding is optimum, in the sense that the total time for typesetting is minimized, using a model that generalizes well-known 'demand paging' strategies to the case where changes to the cache are allowed before the associated information is actually needed. Extensive empirical data shows that good results are obtained even when difficult technical material is being typeset on a machine that can store information concerning only 100 characters. The methods of this paper are also applicable to other hardware and software caching applications with restricted lookahead.
Author (GRA)

N83-14961# Los Alamos Scientific Lab., N. Mex.
ON-LINE REPLACEMENT OF A PARTICLE ACCELERATOR

CONTROL COMPUTER
D. E. Schultz and S. K. Brown 1981 6 p refs Presented at IEEE Meeting, Miami, Fla., 7 Dec. 1981
(Contract W-7405-eng-36)
(DE81-030254; LA-UR-81-2474; CONF-811204-1) Avail: NTIS HC A02/MF A01

The conversion from an existing production control computer, an SEL 840, to a DEC VAX 11/780 is described. The plan is to add a layer of hardware to accomplish a smooth and gradual transition from the 840 to the VAX while leaving the underlying equipment unchanged. The architecture of the control system software is discussed for a large linear accelerator from the standpoint of its requirements and the particular design philosophy chosen. DOE

N83-14962# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
PREPROCESSING OF FLIGHT TEST DATA
H. A. Tuinenberg 13 May 1982 39 p refs Presented at 4th AGARD Special Course on Flight Test Instrumentation, Delft, May 1981
(NLR-MP-81033-U) Avail: NTIS HC A03/MF A01

The role of the data processing station of the Fokker F29 aircraft flight test data acquisition, recording and processing system is outlined. Data transcription, transformation, computation and presentation are described, along with the relevant data structures. Author (ESA)

N83-14963# Fondazione Ugo Bordoni, Rome (Italy).
RECONFIGURABILITY AND FAULT TOLERANCE OF SOME REAL TIME DATA PROCESSING SYSTEMS [RICONFIGURABILITA E TOLLERANZA AL GUASTI DI ALCUNI SISTEMA DI ELABORAZIONE REAL-TIME]
Bruno Ciciani Feb. 1982 51 p refs In ITALIAN Sponsored by CNR
(FUB-11-1928) Avail: NTIS HC A04/MF A01

High reliability data processing systems are described, including the Self Testing and Repairing Computer, the Fault Tolerant Spaceborne Computer, the Self Checking Computer Module, the Software Implemented Fault-Tolerant, the Fault Tolerant Multiprocessor and the United Data System. Large differences between the techniques used in each case are recognized. The development trends identified include the increasing utilization of multiprocessor systems, interchangable modules and software fault-tolerant procedures. Author (ESA)

N83-14341*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MARK IVA MICROPROCESSOR SUPPORT
A. L. Burford *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 148-153 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N83-14964# Council for Scientific and Industrial Research, Pretoria (South Africa).
FIRST SOUTH AFRICAN APL SYMPOSIUM
1982 159 p refs Symp. held in Pretoria, 16 Feb. 1982
(S-272; ISBN-0-7988-2315-1) Avail: NTIS HC A08/MF A01

The development and application of the APL programming language was discussed. The following APL applications are defined: a tool to identify options in energy policy formulation; investment research; engineering applications; dynamic development tool for actuaries and system designers; commercial planning language; definitions of APL functions; and mathematical language in operations research and statistics. For individual titles, see N83-14965 through N83-14970.

N83-14965# Economic Data Processing Proprietary, Ltd. Pretoria (South Africa).
GETTING STARTED WITH APL
Frederick Macaskill *In* CSIR 1st South African APL Symp. 1982 5 p (For primary document see N83-14964 05-61)
Avail: NTIS HC A08/MF A01

The position of a typical problem and how this problem is then solved in APL is examined. In the process of solution a subset of the language is developed. The primitive functions are covered. The concept of an operator is introduced by using the reduction and directional operators as examples. The symbolic nature of the language and its method of evaluating expressions from right to left are discussed. E.A.K.

N83-14966# IBM S.A. Proprietary Ltd., Johannesburg (South Africa).
THE PHILOSOPHY OF APL
H. J. Messerschmidt *In* CSIR 1st South African APL Symp. 1982 34 p refs (For primary document see N83-14964 05-61)
Avail: NTIS HC A08/MF A01

The APL systems design is outlined. Four aspects of simplicity are incorporated: uniformity, generality, familiarity, and brevity. The APL has only four basic language elements: data, functions, operators, and statements. The functions manipulate the data. The APL programming consists of extending the language with user functions of increasing complexity till a function that solves the user's problem is arrived at. The APL functions are either niladic, monadic, or dyadic. Operators work on primitive functions to form new functions. Statements come in four basic types only. E.A.K.

N83-14967# Council for Scientific and Industrial Research, Pretoria (South Africa).
THE EVOLUTION OF APL AT INFOGOLD
W. J. Corrie (INFOGOLD) *In its* 1st South African APL Symp. 1982 23 p refs (For primary document see N83-14964 05-61)
Avail: NTIS HC A08/MF A01

The change in approach to APL systems design over the past 4 years is discussed. The PROMIS Mine Planning system which is used as an example evolved from a stand alone, all in workspace program which required a 2 megabyte workspace, to a file based system running in one quarter megabyte. It now has 25 users and interfaces with other APL and non APL systems. It employs concurrent batch APL for the production of reports. E.A.K.

N83-14968# Council for Scientific and Industrial Research, Pretoria (South Africa). Dept. of Mineral and Energy Affairs.
ENERGY POLICY FORMULATION IN SOUTH AFRICA. APL AS A TOOL TO IDENTIFY OPTIONS
R. B. Silberberg *In its* 1st South African APL Symp. 1982 15 p refs (For primary document see N83-14964 05-61)
Avail: NTIS HC A08/MF A01

The energy situation and the options that face the policymaker in South Africa are outlined. APL is used to develop models of the supply and demand sectors and project future energy scenarios, to provide a basis for policy formulation. The process as it is applied to coal exports, is described. E.A.K.

N83-14969# Council for Scientific and Industrial Research, Pretoria (South Africa). National Research Inst. for Mathematical Sciences.
DIRECT DEFINITION OF APL FUNCTIONS
Moshe Sniedovich *In its* 1st South African APL Symp. 1982 17 p refs (For primary document see N83-14964 05-61)
Avail: NTIS HC A08/MF A01

The direct definition form of functions in APL is presented. It is extended to allow users to: (1) localize names; (2) specify whether the function being defined should have an explicit result; (3) enter multiple lines; and (4) define iterative functions. A utility function supporting these extensions is presented. These extensions and

the supporting function make the direct form more amenable to mathematically and nonmathematically oriented applications.
E.A.K.

N83-14970# Council for Scientific and Industrial Research, Pretoria (South Africa).
APL AS A MATHEMATICAL LANGUAGE IN OPERATIONS RESEARCH AND STATISTICS
D. C. Currin *In its* 1st South African APL Symp. 1982 12 p refs (For primary document see N83-14964 05-61)
Avail: NTIS HC A08/MF A01

The application of APL in the development of algorithms, which is an important facet of Operations Research and Statistics is discussed. The APL can be used in the implementation phase, and also as a tool to facilitate the entire development process. This aspect of APL is illustrated by using examples from project management and forecasting.
E.A.K.

N83-14971*# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
COMPUTER SIMULATION OF SURFACE AND FILM PROCESSES Semiannual Status Report, 1 May - 31 Oct. 1982
William A. Tiller 20 Dec. 1981 102 p refs
(Contract NCC2-125)
(NASA-CR-169666; NAS 1.26:169666; SU-DMS-83-R-1) Avail: NTIS HC A06/MF A01 CSCL 09B

A molecular dynamics technique based upon Lennard-Jones type pair interactions is used to investigate time-dependent as well as equilibrium properties. The case study deals with systems containing Si and O atoms. In this case a more involved potential energy function (PEF) is employed and the system is simulated via a Monte-Carlo procedure. This furnishes the equilibrium properties of the system at its interfaces and surfaces as well as in the bulk.
Author

N83-14972# Naval Ship Research and Development Center, Bethesda, Md.
FUNCTIONAL DESCRIPTION OF AN INTERACTIVE SIGNAL SYNTHESIS SYSTEM Final Report
S. Berkowitz Sep. 1982 22 p refs
(AD-A119330; DTNSRDC-82/073) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Interactive Signal Synthesis System is a user-oriented Fortran program designed to give the signal analyst the ability to generate controlled time series of arbitrary length and complexity. With the system, one cannot only parameterize basic signal functions such as tone, gate, noise, polynomial, and arbitrary data, but also parameterize the shifted sum, damping, modulation, and filtering of each function.
Author (GRA)

N83-14973# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
SOFTWARE OPTIMIZATION FOR ARRAY PROCESSORS. AN AP-120B KALMAN FILTER Final Report, 1 Apr. 1981 - 28 May 1982
Edward C. Dudzinski 1 Jun. 1982 120 p refs
(AF Proj. 6095)
(AD-A119221; AFWAL-TR-82-1100) Avail: NTIS HC A06/MF A01 CSCL 12/1

The fusion of navigation sensor data to arrive at an accurate position determination is done by a programmed algorithm, a Kalman filter. Achieving the necessary processing speed for next generation navigation filters requires the use of innovative machine architectures. One of the most promising configurations, given the computational nature of the Kalman filter, is the array processor. To explore the software issues and demonstrate the potential speedup made possible by an array architecture, an in house research project was undertaken to install a Kalman filter on a vector machine and maximize its execution speed. To assess software optimization techniques, processing times for a simulated scenario were measured initially with the AP-120B programmed to function as if it were a strictly serial processor, and then again after the software had been optimized to exploit the machine's parallel architecture. Algorithm restructuring, expression tree height reduction, maximization of loop parallelism, and other techniques were applied to the Kalman filter algorithm chosen for this project.
GRA

N83-14974# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PROTOCOLS OF USERS MANIPULATING VISUALLY PRESENTED INFORMATION WITH NATURAL LANGUAGE
Candace L. Sidner Sep. 1982 122 p refs
(Contract N00014-77-C-0378)
(AD-A119762; BBN-5128) Avail: NTIS HC A06/MF A01 CSCL 09/2

This document contains a complete set of transcripts for a set of protocols collected at BBN by Candy Sidner, with the help of Rusty Bobrow and Jeff Gibbons, in the spring of 1980. In all, eight protocols were collected, two preliminary ones and six main ones. The two preliminary protocols are based on the task of designing a 1 bit adder and a 4 bit parallel adder as are three of the main protocols, while the other three make use of KL-1 as a database system with graphic representation. The purpose of these protocols, and hence the design of the tasks, was to obtain data about how people talk about graphically presented material which they are trying to manipulate in some way. In particular, we were interested in the kinds of references people made and what sorts of instructions they gave to the machine.
Author (GRA)

N83-14975# University of Southern California, Marina del Rey. Information Sciences Inst.
PROGRAM DEVELOPMENTS: FORMAL EXPLANATIONS OF IMPLEMENTATIONS
David S. Wile Aug. 1982 50 p refs
(Grant NSF MCS-79-18792)
(AD-A119675; ISI/RR-81-99) Avail: NTIS HC A03/MF A01 CSCL 09/2

Automated program transformation systems are emerging as the basis for a new programming methodology in which high-level, understandable specifications are transformed into efficient programs. Subsequent modification of the original specification will be dealt with by reimplementation of the specification. For such a system to be practical, these reimplementations must occur relatively quickly and reliably, in comparison with the original implementation. We believe the reimplementation requirement necessitates that a formal document--the program development--be constructed during the development process to explain the resulting implementation to future maintainters of the specification. The overall goal of our work has been to develop a language for capturing and explaining these developments and the resulting implementations. This language must be capable of expressing: the implementor's goal structure, all program manipulations necessary for implementation and optimization, and plans of such optimizations. In this report, we discuss the documentation requirements of the development process and then describe a prototype system for constructing and maintaining this documentation information. Finally, we indicate the many remaining open issues and the direction to be taken in the pursuit of solutions.
Author (GRA)

N83-14976# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF A COMPUTER PROGRAM FOR THE TESTING AND EVALUATION OF NUMERICAL OPTIMIZATION TECHNIQUES M.S. Thesis
James Edward Fitzgerald, III Jun. 1982 83 p refs
(AD-A119571) Avail: NTIS HC A05/MF A01 CSCL 09/2

A three dimensional finite element code is written for truss analysis and design. Trusses may be designed for minimum weight subject to constraints on: member stresses, Euler buckling, joint displacements and system natural frequency. The optimum configuration may be found in addition to optimization with respect to member sizes.
Author (GRA)

N83-14977# Naval Postgraduate School, Monterey, Calif.
CREATION OF A TRANSPORTABLE INTERACTIVE USER INTERFACE FOR IMPROVED AAA SIMULATION COMPUTER

PROGRAM (P001) M.S. Thesis
Eric R. Johns Jun. 1982 172 p refs
(AD-A119636) Avail: NTIS HC A08/MF A01 CSCL 09/2

The Air Force Armament Laboratory AAA Simulation Computer Program and MICE II have been adapted for batch processing use on the Naval Postgraduate School IBM 3033 computer. To ease data entry and reduce errors, a preprocessor program (PIP) was written at the school. The modifications necessary to convert PIP from a batch program to an interactive one are described herein. GRA

N83-14978# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
SALOME, A STRUCTURED AND LOGICALLY MINIMAL ENSEMBLE OF PROGRAMMING CONSTRUCTS Final Report
Royce W. Soanes, Jr. Jul. 1982 23 p Presented at the Army Numerical Anal. and Computers Conf., Vicksburg, Miss., 3-4 Feb. 1982
(DA Proj. 1L1-61102-AH-60)
(AD-A119398; AD-E440160; ARLCM-TR-82021) Avail: NTIS HC A02/MF A01 CSCL 09/2

An overview of the SALOME structured programming language will be given, along with an appendix briefly describing its syntax and semantics. SALOME has been designed with the FORTRAN programmer in mind. The SALOME source language is supported by a translator having a target language of standard FORTRAN, and FORTRAN code may be injected into SALOME source code when needed. The SALOME translator has been written in SALOME and FORTRAN. GRA

N83-14979# Stanford Univ., Calif. Linear Accelerator Center.
HARDWARE FOR KINEMATIC STATISTICAL GRAPHICS
Jerome H. Friedman and Werner Stuetzle Nov. 1981 19 p refs
(Contracts N00014-81-K-0340; DE-AC03-76SF-00515; DE-AT03-81ER-10843; Proj. ORION)
(AD-A119801; ORION-005) Avail: NTIS HC A02/MF A01 CSCL 09/2

The hardware requirements for a computer graphics system capable of supporting kinematic statistical graphics are specified. The various options are discussed, and the ORION-1 workstation currently in use at the Stanford Linear Accelerator Center is described. Author (GRA)

N83-14980# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
COMPUTER CENTER MASS STORAGE SYSTEM USER'S GUIDE
Stanley E. Willner Jul. 1982 16 p
(AD-A119542; DTNSRDC/CMLD-82-19) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Computer Center Mass Storage System user's Guide presents an overview, for the User of the CDC NOS/BE Operating Systems, of the Mass Storage system (MSS) hardware and software. Job control statement syntax and specific examples of job control statements which interface with the MSS are included. Author (GRA)

N83-14981# Texas Univ., Austin. Center for Cybernetic Studies.
CHANCE CONSTRAINED PROGRAMMING METHODS IN PROBABILISTIC PROGRAMMING
A. Charnes and W. W. Cooper Mar. 1982 18 p refs
(Contracts N00014-75-C-0569; N00014-81-C-0236; N00014-81-C-0410; MDA903-81-C-0365)
(AD-A119553; CCS-RR-427) Avail: NTIS HC A02/MF A01 CSCL 09/2

This is a response to the article 'Decision Problems Under Risk and Chance Constrained Programming: Dilemmas in the Transition' (25) in which Professors Hogan, Morris and Thompson (HMT hereafter) recommend abandonment of Chance Constrained Programming (=CCP) in favor of Stochastic Programming with Recourse (=SPR)--which we shall also refer to as 2-stage Linear Programming Under Uncertainty (=LPUU) since this is the main variant of SPR which is relied upon for these conclusions in (25). In the interest of clarity and brevity, we do not pursue all of the topics covered in (25) since, as will become evident, a rather lengthy response is required to chase down even major issues. We also believe that (25) is directed to conceptual rather than practical issues of application and so, also for brevity, we brush aside qualifiers that appear in statements like the following: 'We wish to emphasize that recourse problems characterize almost all (sic) real decision problems involving risk.' Except for possibly affording some degree of protection to HMT, we do not see that such qualifiers serve any useful purpose. GRA

N83-14982# Fail-Safe Technology Corp., Los Angeles, Calif.
US NAVY FAULT-TOLERANT MICROCOMPUTER Final Report
M. W. Sievers, G. A. Kravetz, B. A. Dussian, and J. D. Jackson Jul. 1982 130 p refs
(Contract N00014-82-C-0126)
(AD-A119405) Avail: NTIS HC A07/MF A01 CSCL 09/2

This Fail-Safe Technology Report includes the results of a feasibility study, preliminary design and recommendations for subsequent work. Fault tolerance is the unique attribute of a computer system that enables that system to continue its program-specified behavior in spite of the occurrence of faults. This feature is essential and cost-effective in applications where computer failure causes human injury or loss of critical data or equipment. For less critical applications, inclusion of fault detection and diagnostic procedures within the computer itself greatly increases repair time with a concomitant reduction in maintenance cost and downtime. Included in this report are discussions of the applications, tradeoffs and requirements that led to the suggested architecture. An Executive Summary in Section 3 outlines the results of these discussions. The preliminary suggested hardware and software design is then shown. Specific recommendations for direction of further productive efforts are also included in this report. An overview of the state-of-the-art concepts and techniques employed in fault tolerant computer designs is added as Appendix I. GRA

N83-14983# CAECO, Inc., Orem, Utah.
TAURUS: AN INTERACTIVE POST-PROCESSOR FOR THE ANALYSIS CODES NIKE3D, DYNA3D, TACO3D, AND GEMINI
Bruce E. Brown and J. O. Hallquist (Lawrence Livermore National Lab.) Jul. 1982 92 p refs
(Contract W-7405-eng-48)
(DE82-019792; UCID-19392) Avail: NTIS HC A05/MF A01

A user's manual for the post-processor, TAURUS is given. TAURUS reads the binary plot files generated by the three-dimensional finite element codes and plots contours, time histories, and deformed shapes. Contours of a large number of quantities may be plotted on meshes consisting of plate, shell, and solid type elements. TAURUS can compute a variety of strain measures, reaction forces along constrained boundaries, and momentum. TAURUS is operational on the CRAY-1 and 7600 computers. DOE

N83-14984# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTER-AIDED ENGINEERING; THE STEP BEYOND
Lansing Hatfield, Stanley R. Trost, Dennis W. O'Brien, and Charles L. Pomernacki 6 Nov. 1981 6 p Presented at the 15th Ann. Asilomar Conf. on Circuits, Systems and Computers, Monterey, Calif., 9-11 Nov. 1981
(Contract W-7405-eng-48)
(DE82-003318; UCRL-86879; CONF-811139-1) Avail: NTIS HC A02/MF A01

Computer aided design and computer aided manufacturing are discussed in light of the manpower shortage and the need for improved engineering productivity. Requirements for a computer aided engineering (CAE) system are developed and a CAE plan is outlined. DOE

N83-14985# Sandia Labs., Albuquerque, N. Mex.
METHODS OF REDUCING PROGRAM EXECUTION TIME UNDER RT-11 FORTRAN
Bob Isidoro and Ron Trellue 1981 11 p Presented at the 1981

Fall DECUS Symp., Los Angeles, 7 Dec. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003342; SAND-81-2494C; CONF-811214-1) Avail: NTIS HC A02/MF A01

A requirement to double the number of data channels for our RT-11 data acquisition and processing system on a PDP 11/34 with RK05 disks from 64 channels to 128 led us to consider reducing the size of the buffers used to sort the data since the program size had already reached the upper limit. But the reduction in buffer size could result in a significant increase in processing time. It was decided to conduct a benchmark study to determine if processing time could be improved by using virtual arrays to optimize buffer size. Additional test runs were performed utilizing cache memory, a floating point processor, different disks, and various processors. The results of this study should provide our management with sufficient data to determine the cost effectiveness of buying additional memory, or other improvements to the present RT-11 systems. DOE

N83-14986# Sandia Labs., Albuquerque, N. Mex.
STATISTICAL UNCERTAINTY ANALYSIS OF COMPUTER MODELS
R. G. Easterling 1981 27 p refs Presented at the DOE Statist. Symp., Long Island, N.Y., 4 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-001917; SAND-81-2230C; CONF-81-1125) Avail: NTIS HC A03/MF A01

Consider computer models that calculate an output parameter given specified input parameters. If the chosen inputs are parameter estimates based on data, the output is a statistical estimate. The problem addressed is the assessment of the statistical imprecision of this estimate. The methods considered for obtaining a standard error of the estimate and approximate confidence intervals for the output parameter are the jackknife, parametric and nonparametric bootstrap analyses, a Bayesian/fiducial analysis, and Taylor's series approximations. These methods are evaluated using a six parameter function that approximates radioactive waste migration. The results are generally favorable to the jackknife and Taylor's series analyses. DOE

N83-14987# California Univ., Livermore. Lawrence Livermore Lab.
EFFICIENT NETWORK GRAPHICS
James F. Leighton 29 Oct. 1981 11 p refs Presented at the Intern. Symp. on Systems Sci., Honolulu, Hawaii, 6 Jan. 1982
(Contract W-7405-eng-48)
(DE82-002527; UCRL-85855; CONF-820104-3) Avail: NTIS HC A02/MF A01

The transmission of graphics data over a data-communications network is typically a time-consuming process because of the large amounts of data required and limited bandwidth generally available. At the National Magnetic Fusion Energy Computer Center, an efficient data-compression scheme for graphics data and a design for a graphics system that is compatible with this scheme were developed. This system and its effect on the user are described, and a discussion of the workability of displaying successively changing frames (movies) at acceptable speeds is included. DOE

N83-14988# Centre Technique des Industries Mecaniques, Senlis (France).
CAPROR PROGRAM PROGRAMMING ROLES [NORME INFORMATIQUE DU LOGICIEL CAPROR]
F. Osweiller 17 May 1982 82 p In FRENCH
(CETIM-14-B-121) Avail: NTIS HC A05/MF A01

The CAPROR program, which computes pressure vessel parameters under the French code regulations using Basic language in microcomputers is introduced. A theoretical study of the programming rules for the seven chapters of the pressure vessel French code regulations is presented. Each of the seven modules may be utilized in a verification mode or an optimization mode. The symbols are defined and listed. Examples are given. Author (ESA)

N83-14938# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
SALOME, A STRUCTURED AND LOGICALLY MINIMAL ENSEMBLE
Royce W. Soanes, Jr. *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 305-322 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 09/2

N83-14940# Naval Surface Weapons Center, Dahlgren, Va.
MATHEMATICAL SOFTWARE AND MATHEMATICAL SOFTWARE LIBRARIES
Alfred H. Morris, Jr. *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 357-364 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 09/2

N83-14342*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A DSN OPTIMAL SPACECRAFT SCHEDULING MODEL
W. A. Webb *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 154-165 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N83-14989# Oak Ridge National Lab., Tenn. Dept. of Computer Sciences.
AUTOMATIC DATA-ACQUISITION AND COMMUNICATIONS COMPUTER NETWORK FOR FUSION EXPERIMENTS
C. O. Kemper 1981 3 p Presented at the 9th Symp. on Eng. Problems of Fusion Res., Chicago, 26 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002919; CONF-811040-102) Avail: NTIS HC A02/MF A01

A network of more than twenty computers serves the data acquisition, archiving, and analysis requirements of the ISX, EBT, and beam-line test facilities at the Fusion Division of Oaks Ridge National Laboratory. The network includes PDP-8, PDP-12, PDP-11, PDP-10, and Interdata 8-32 processors, and is unified by a variety of high-speed serial and parallel communications channels. While some processors are dedicated to later analysis and theoretical work, many processors perform a combination of acquisition, real-time analysis and display, and archiving and communications functions. A network software system has been developed which runs in each processor and automatically transports data files from point of acquisition to point or points of analysis, display, and storage, providing conversion and formating functions are required. DOE

N83-14990# Fondazione Ugo Bordoni, Rome (Italy).
STUDY OF A DISTRIBUTED DATA ACQUISITION SYSTEM [STUDIO PER UN SISTEMA DISTRIBUITO DI ACQUISIZIONE DATI]
Salvatore Nicosia (Rome Univ.) and Alessandro Perugia May 1982 26 p refs In ITALIAN
(FUB-10-1982) Avail: NTIS HC A03/MF A01

The reliability of a data acquisition system is examined. The system, developed for use in nuclear reactor generation plants, is composed of intelligent peripheral concentrators and a central master unit interconnected by a multipoint technique. Each concentrator manages a number of inlets and is implemented with a serial receiver-transmitter, interface modules to the serial channels, inlet modules (filtering and preprocessing of inlets) and analog-digital converting modules. Formulas giving the availability of a single channel and the average number of simultaneous active channels are presented for two redundancy configurations. The experimental implementation of concentrator modules is described,

based on the utilization of 8085 and 8273 Intel microprocessors.
Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N83-14991# Yale Univ., New Haven, Conn. Dept. of Engineering and Applied Science.
STRUCTURE OF AUTOMATIC CONTROL SYSTEMS Final Report, 1 Oct. 1976 - 30 Sep. 1981
A. Stephen Morse 28 May 1982 6 p refs
(Grant AF-AFOSR-3176-77; AF Proj. 2304)
(AD-A118867; AFOSR-82-0665TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A bibliography of research reports and papers on the Structure of Automatic Control Systems produced from 1976 to 1981 under AFOSR Grant 77-3176 is presented. GRA

N83-14992# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
REGENERATIVE SIMULATION USING INTERNAL CONTROLS Ph.D. Thesis
Jan Denise Eakle-Cardinal 1982 196 p refs
(AD-A119740; AFIT/CI/NR/82-53D) Avail: NTIS HC A09/MF A01 CSCL 12/1

A new procedure is developed to exploit the asymptotic properties of appropriately defined controls in order to improve the efficiency of system performance estimators obtained from a simulation experiment. Two types of standardized variates are formulated and their joint convergence in distribution to multivariate normality is established. This result is the basis for applying multinormal regression theory to the construction of valid confidence intervals for steady-state parameters. A two-stage procedure is developed. In the first stage, standardized flow variates are applied to the denominator of the classical regenerative ratio estimator to reduce its inherent bias. In the second stage, standardized service-time variates are applied to the numerator of the new ratio to reduce the variance of the resulting double multivariate ratio estimator. A new multivariate test for normality is also developed based on the univariate Shapiro-Wilkes test. The complete variance eduction procedure is validated on an analytically tractable closed Jackson queueing system. On the basis of experimental results together with the estabished theoretical characteristics of the technique, guidelines are presented for the practical application of the method. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N83-14993*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VLSI DESIGN OF A SINGLE CHIP REED-SOLOMON ENCODER
T. K. Truong, L. J. Deutsch, and I. S. Reed (Univ. of Southern California) 15 Nov. 1982 52 p refs Sponsored by NASA
(NASA-CR-169663; JPL-Pub-82-84; NAS 1.26:169663) Avail: NTIS HC A04/MF A01 CSCL 12A

A design for a single chip implementation of a Reed-Solomon encoder is presented. The architecture that leads to this single VLSI chip design makes use of a bit serial finite field multiplication algorithm. A.L.

N83-14994*# Virginia Univ., Charlottesville. Dept. of Applied Mathematics and Computer Science.
ITERATIVE ALGORITHMS FOR LARGE SPARSE LINEAR SYSTEMS ON PARALLEL COMPUTERS
Loyce M. Adams Hampton, Va. NASA. Langley Research Center Nov. 1982 211 p refs
(Grant NAG1-46)
(NASA-CR-166027; NAS 1.26:166027) Avail: NTIS HC A10/MF A01 CSCL 12A

Algorithms for assembling in parallel the sparse system of linear equations that result from finite difference or finite element discretizations of elliptic partial differential equations, such as those that arise in structural engineering are developed. Parallel linear stationary iterative algorithms and parallel preconditioned conjugate gradient algorithms are developed for solving these systems. In addition, a model for comparing parallel algorithms on array architectures is developed and results of this model for the algorithms are given. R.J.F.

N83-14995# Illinois Univ., Chicago. Dept. of Mathematics.
APPLICATION OF THE CONDITIONAL POPULATION-MIXTURE MODEL TO IMAGE SEGMENTATION
Stanley L. Sclove 15 Aug. 1982 25 p refs Revision
(Contract N00014-80-C-0408; NR Proj. 042-443)
(AD-A118866; UICC-MATH-TR-82-5) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of image segmentation is considered in the context of a mixture of probability distributions. The segments fall into classes. A probability distribution is associated with each class of segment. Parametric families of distributions are considered, a set of parameter values being associated with each class. With each observation is associated an unobservable label, indicating from which class the observation arose. Segmentation algorithms are obtained by applying a method of iterated maximum likelihood to the resulting likelihood function. A numerical example is given. Choice of the number of classes, using Akaike's information criterion (AIC) for model identification, is illustrated. GRA

N83-14996# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
POLYNOMIAL APPROXIMATION: THE WEIERSTRASS APPROXIMATION THEOREM M.S. Thesis - Hawaii Univ.
Shirley Jo Nichols Aug. 1982 31 p refs
(AD-A118974; AFIT/CI/NR/82-46T) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper we will look at three proofs of the Weierstrass Approximation Theorem. The first proof is in much the same form in which Weierstrass originally proved his theorem. The next is due to Lebesgue. It is by far the easiest proof to follow, with only a minimum knowledge of analysis required. The last arises from probability and uses the Bernstein polynomials. Secondly we look at a generalization of this theorem, called the Stone-Weierstrass Theorem. This generalization was inspired by modern developments in mathematics. The theorem deals with functions on a general compact space rather than on a closed interval. GRA

N83-14997# SRI International Corp., Menlo Park, Calif. Physical Sciences Div.
TWO-DIMENSIONAL MESH ADJUSTMENT ALGORITHM Final Scientific Report, 1 Jun. 1977 - 31 May 1982
C. M. Ablow 31 Jul. 1982 6 p
(Contract F49620-77-C-0114; AF Proj. 2304)
(AD-A119201; AFOSR-82-0719TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Mesh adjustment by the use of solution-dependent monitor functions that take equally spaced values at mesh nodes has been studied mainly by means of examples. The simplest effective monitor is distance along the solution curve or surface. This monitor provides the desired concentration of nodes where the solution has large variation. A monitor depending on both distance and curvature can be much more effective. A 'best' monitor that minimizes the truncation error of the difference method of numerical solution has been found and used as a standard of comparison. Application of the monitors to reactive flows or flows over an airfoil has been impeded by as yet unexplained technical difficulties. Author (GRA)

N83-14998# San Diego State Univ., Calif. Dept. of Mathematical Sciences.
INFERENCE FOR WEIBULL-TYPE POISSON PROCESSES (ESTIMATION AND SIGNAL DETECTION)
S. M. Lee and C. B. Bell Aug. 1982 40 p refs
(Contract N00014-80-C-0208)
(AD-A119522; Rept-5-82) Avail: NTIS HC A03/MF A01 CSCL 12/1

Signal detection is studied in the context of Weibull-type non-homogeneous Poisson processes. Inference for the one- and two-parameter cases is treated for four different sampling plans-Type I- and Type II- censoring; same-shape and same-distance sampling. Extensions of the Kolmogorov-Simirnov statistic are employed as well as techniques based on the likelihood function. Author (GRA)

N83-14999# Rensselaer Polytechnic Inst., Troy, N. Y.
THE FORM, AND SOME ROBUSTNESS PROPERTIES OF INTEGRATED DISTANCE ESTIMATORS FOR LINEAR MODELS, APPLIED TO SOME PUBLISHED DATA SETS Interim Technical Report
A. S. Paulson and E. H. Nicklin (Alex Brown and Sons) 1 Jun. 1982 44 p refs
(Contract DAAG29-81-K-0110)
(AD-A119728; A-1; ARO-18072.1-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

A critical procedure for use in linear models is introduced and developed in some detail. It is based on a nonlinear analogue to the usual linear least squares procedure, more specifically, in the integrated distance between characteristic functions (densities) and their sample counterparts. Location and scale parameters are estimated simultaneously. The procedure depends on a user specified parameter which may be varied to determine the sensitively of the parameters and observational weights to such variation. A sensitivity analysis of this type is useful in isolating potential problems with the data or with the assumed model. When the procedure is employed with the user-oriented parameter held fixed, a robust procedure results. The statistical properties of this procedure are discussed in some detail. A number of illustrations, taken from the literature, are examined. Author (GRA)

N83-15000# University of Southern California, Marina del Rey. Information Sciences Inst.
ON THE EQUIVALENCE OF IF-THEN-ELSE AND MAX-MIN
Leo Marcus Aug. 1982 8 p
(Contracts DAHC15-72-C-0308; F30602-78-C-0008)
(AD-A119739; ISI/RR-81-92) Avail: NTIS HC A02/MF A01 CSCL 12/1

Any term of the form max(s) can be expressed as if s<t, then t else s; and the case is similar for min. In this note, we examine the converse question. We show that any term containing one variable built from linear functions and if-then-else is equivalent to a max-min expression, but this is not the case for terms containing two or more variables. Author (GRA)

N83-15001# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
THE MINIMAX FINITE ELEMENT METHOD
Il-Bahng Park and W. D. Pilkey 1982 25 p refs
(Contract N00014-75-C-0374)
(AD-A119604; A-82-7) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper, the minimax method is applied to boundary value problems which arise in structural mechanics. This is a weighted residual method in which the maximum absolute value of a residual is minimized. Like other weighted residual methods (7, 13), a trial function is employed which consists of undetermined parameters and basis functions. This trial function is introduced into governing differential equations, and the maximum absolute residual among several residuals at discrete points in the domain is minimized. This residual minimization criterion is applied to a finite element formulation by using piece wise trial functions defined on each element. Author (GRA)

N83-15002# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
EFFICIENT REANALYSIS OF LOCALLY MODIFIED STRUCTURES
B. P. Wang (Sperry Marine Systems) and W. D. Pilkey 1980 27 p refs
(Contract N00014-75-C-0374)
(AD-A119606; A-82-6) Avail: NTIS HC A03/MF A01 CSCL 12/1

A unified efficient formulation for the static, dynamic, and stability reanalysis of locally modified structures is presented. The reanalysis problem is to find the structural responses when some of the element properties are adjusted as a result of design modifications. The reanalysis problem is formulated as a problem of much lower order than the original system. This is achieved by utilizing the linearity property of the structure using the pseudo-load concept, together with the solution of the original system. The modifications to the structure are treated as displacement dependent pseudo-loads of the system. By expressing the modified system response as linear combinations of the response of the original system and a term depending on the pseudo-load, a reduced set of response equations can be obtained. In the static and sinusoidal steady state analyses, this leads to a set of linear algebraic equations. For free vibration and stability analyses, this results in an eigenvalue problem. General modifications involve multiple parameters so that numerical solutions are required. Numerical examples are included. For the special case of a single parameter variation, a simple closed form formulation of the reanalysis problem is provided. Explicit reanalysis formulas are presented for changes in the cross-sectional area of truss members, the stiffness of beams, the thickness of plane stress elements, and lumped springs and masses. Author (GRA)

N83-15003# Stanford Univ., Calif. Project ORION.
ESTIMATING OPTIMAL TRANSFORMATIONS FOR MULTIPLE REGRESSION AND CORRELATION
Leo Brieman and Jerome H. Friedman Jul. 1982 81 p refs
(Contracts N00014-82-K-0054; N00014-81-K-0340)
(AD-A119802; ORION-010) Avail: NTIS HC A05/MF A01 CSCL 12/1

It is shown that optimal transformations exist and satisfy a complex system of integral equations. The heart of the approach is that there is a simple iterative algorithm using only bivariate conditional expectations which converges to an optimal solution. When the conditional expectations are estimated from a finite data set, then use of the algorithm results in estimates of the optimal transformations. In the bivariate case the procedure can be regarded as a method for estimating the maximal correlation between two variables. M.G.

N83-15004# Stanford Univ., Calif. Project ORION.
SMOOTHING OF SCATTERPLOTS
Jerome H. Friedman and Werner Stuetzle Jul. 1982 50 p refs
(Contracts N00014-81-K-0340; DAAG29-82-K-0056; DE-AC03-76SF-00515; DE-AT03-81ER-10843)
(AD-A119814; ORION-003) Avail: NTIS HC A03/MF A01 CSCL 09/2

A variable span scatterplot smoother based on local linear fits is described. Local cross-validation is used to estimate the optimal span as a function of abscissa value. A rejection rule is suggested to make the smoother resistant against outliers. Computationally efficient algorithms making use of updating formulas and corresponding FORTRAN subroutines are presented. Author (GRA)

N83-15005# Georgia Inst. of Tech., Atlanta. School of Psychology.
A MULTIVARIATE TEST FOR HOMOGENEITY OF REGRESSION WEIGHTS FOR CORRELATED DATA
Lawrence R. James and Lois E. Tetrick 15 Sep. 1982 22 p refs
(Contract N00014-80-C-0315)
(AD-A119535; GT-ONR-3) Avail: NTIS HC A02/MF A01 CSCL 12/1

An analytic procedure is presented for testing the homogenity of unstandardized regression weight vectors in the condition that the regression weight vectors are correlated. The basic design involves repeated measurements on a dependent variable and a set of independent variables in each of S time periods of situations. Use of the test is illustrated in a study of cross-situational consistency versus cross-situational specificity of the correlates of perceived leader behavior. Author (GRA)

N83-15006# Stanford Univ., Calif. Dept. of Computer Science.
TIME-SPLIT METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS Ph.D. Thesis
Randall John LeVeque Apr. 1982 104 p refs
(Contract N00014-75-C-1132)
(AD-A119417; SU-STAN-CS-82-904) Avail: NTIS HC A06/MF A01 CSCL 12/1

This thesis concerns the use of time-split methods for the numerical solution of time-dependent partial differential equations. Frequently the differential operator splits additively into two or more pieces such that the corresponding subproblems are each easier to solve than the original equation, or are best handled by different techniques. In the time-split method the solution to the original equation is advanced by alternately solving the subproblems. In this thesis a unified approach to splitting methods is developed which simplifies their analysis. Particular emphasis is given to splittings of hyperbolic problems into subproblems with disparate wave speeds. Three main aspects of the method are considered. The first is the accuracy and efficiency of the time-split method relative to unsplit methods. The second topic is stability for split methods. The final topic is the proper specification of boundary data for the intermediate solutions, e.g., the solution obtained after solving only one of the subproblems. The main emphasis is on hyperbolic problems, and the one-dimensional shallow water equations are used as a specific example throughout. The final chapter is devoted to some other applications or the theory. Two-dimensional hyperbolic problems, convection-diffusion equations, and the Peaceman-Rachford ADI method for the heat equation are considered. GRA

N83-15007# Los Alamos Scientific Lab., N. Mex.
INGEN: A GENERAL PURPOSE MESH GENERATOR FOR FINITE-ELEMENT CODES
W. A. Cook Jun. 1982 43 p refs
(DE82-019704; LA-9402-MS) Avail: NTIS HC A03/MF A01

A general-purpose mesh generaor for two- and three-dimensional finite element codes is described. The basic parts of the code are surface and three-dimensional region generators that use linear-blending interpolation formulas. These generators are based on an i,j,k index scheme, which is used to number nodal points, construct elements, and development displacement and traction boundary conditions. In addition to a description of the basic theory of the INGEN code, user's instructions for INGEN and example problems are included. DOE

N83-15008# Los Alamos Scientific Lab., N. Mex.
SELF-ADJUSTING GRID METHODS FOR ONE-DIMENSIONAL HYPERBOLIC CONSERVATION LAWS
A. Harten and J. M. Hyman Jul. 1982 53 p refs
(Contract W-7405-eng-36)
(DE82-019714; LA-9105) Avail: NTIS HC A04/MF A01

The automatic adjustment of a grid which follows the dynamics of the numerical solution of hyperbolic conservation laws is given. The grid motion is determined by averaging the local characteristic velocities of the equations with respect to the amplitudes of the signals. The resulting algorithm is a simple extension of many currently popular Godunov-type methods. Computer codes using one of these methods can be easily modified to add the moving mesh as an option. Numerical examples are given that illustrate the improved accuracy of Godunov's and Roe's methods on a self-adjusting mesh. DOE

N83-15009# Virginia Polytechnic Inst. and State Univ., Blacksburg.
APPLIED MATHEMATICS OF TRANSPORT THEORY Progress Report, Sep. 1980 - Sep. 1981
William Greenberg and Paul F. Zweifel 1981 12 p refs
(Contract DE-AS05-80ER-10711)
(DE82-002421; DOE/ER-10711/T1) Avail: NTIS HC A02/MF A01

Research is reported in two component gas flows, separation of phases (spinodal decomposition), exit time distribution for randomly perturbed reacting flow systems, validity of asymptotic expansions in homogenization of transport problems, nonlinear evolution equations, thermonuclear plasmas, and generalized transport models. DOE

N83-15010# Sao Paulo Univ. (Brazil). Inst. de Fisica.
APPLICATIONS OF PARTIAL DIFFERENTIAL APPROXIMANTS: TEST FUNCTIONS AND DIMENSIONAL CROSSOVER IN THE ISING MODEL
J. F. Stilck and S. R. A. Salinas [1981] 39 p refs Sponsored in part by FAPESP
(DE81-700573; IFUSP-P-248) Avail: NTIS HC A03/MF A01

The method of partial differential approximants (PDA) has been introduced for approximating functions of two or more variables given a finite number of coefficients of their power series. For the best PDA's flow diagrams are constructed and the scaling functions are estimated. Also, the dimensional crossover (from d=3 to d=2) of the spin - 1/2 axial anisotropic Ising model on the f cc lattice is analyzed. DOE

N83-15011# California Univ., Livermore. Lawrence Livermore Lab.
ADI AS A PRECONDITIONER FOR SOLVING THE CONVECTION-DIFFUSION EQUATION
Raymond C. Y. Chin, Thomas A. Manteuffel (LASL), and John DePillis (California Univ., Riverside) 1981 37 p refs Presented at the Symp. on Multigrid Methods, Moffett Field, Calif., 21-22 Oct. 1981
(Contracts W-7405-eng-48; W-7405-eng-36)
(DE82-003192; UCRL-85941; CONF-8110109-1) Avail: NTIS HC A03/MF A01

The steady convection-diffusion equation -etaDeltaU + a(x, y)u sub s + b(x,y)u sub y + C(x,y)u = f(x,y) on a bounded convex domain D with appropriate boundary conditions is considered. The equation is a model for the Navier-Stokes equation and for the equations of mass and heat transfer. If eta < 1, then the boundary value problem is singularly perturbed. DOE

N83-14931# Mississippi State Univ., Mississippi State. Dept. of Aerospace Engineering.
WESCOR, BOUNDARY-FITTED COORDINATE CODE FOR GENERAL 2D REGIONS WITH OBSTACLES AND BOUNDARY INTRUSIONS
Joe F. Thompson *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 1-76 refs (For primary document see N83-14930 05-59)
(Contract DACW39-78-C-0054)
Avail: NTIS HC A99/MF A01 CSCL 12/1

N83-14932# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
FLUX-CORRECTED TRANSPORT IN AN EXPONENTIALLY STRETCHED GRID
Richard A. Schmalz, Jr. *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 77-98 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

N83-14936# Georgia Inst. of Tech., Atlanta. School of Mathematics.
FREE BOUNDARY PROBLEMS WITH NONLINEAR SOURCE TERMS
Gunter H. Meyer *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 245-251 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

N83-14939# Wisconsin Univ., Madison. Mathematics Research Center.
ACCURATE COMPUTER ARITHMETIC FOR SCIENTIFIC COMPUTATION
L. B. Rall *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 343-356 refs (For primary document see N83-14930 05-59)
(Contract DAAG29-80-C-0041)
Avail: NTIS HC A99/MF A01 CSCL 12/1

N83-14946# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
CONSTRAINED AND UNCONSTRAINED VARIATIONAL FINITE ELEMENT FORMULATION OF SOLUTIONS TO A STRESS WAVE PROBLEM, A NUMERICAL COMPARISON
Julian J. Wu and C. N. Shen *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 477-498 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

N83-14947# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
NUMERICAL SOLUTIONS USING ADJOINT VARIATIONAL FORMULATION TO STRESS WAVE PROBLEMS
C. N. Shen and Julian J. Wu *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 499-516 ref (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

N83-14949# Iowa State Univ. of Science and Technology, Ames. Dept. of Aerospace Engineering.
SOLUTION ADAPTIVE GRIDS FOR PARTIAL DIFFERENTIAL EQUATIONS
Dale A. Anderson *In* Army Research Office Proc. of the 1982 Army Numerical Anal. and Computers Conf. Aug. 1982 p 575-592 refs (For primary document see N83-14930 05-59)
Avail: NTIS HC A99/MF A01 CSCL 12/1

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N83-15012# Stanford Univ., Calif. Dept. of Computer Science.
THE U.R. STRIKES BACK Final Report
Jeffrey D. Ullman Jul. 1982 17 p refs
(Grants AF-AFOSR-0212-80; NSF IST-80-21358; NSF MCS-80-12907; AF Proj. 2304)
(AD-A119145; SU-STAN-CS-81-881; AFOSR-82-0648TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A taxonomy of what is sometimes called the universal relation assumption was developed. Author

N83-15013# Stanford Univ., Calif. Dept. of Statistics.
ON THE EVALUATION OF CERTAIN MULTIVARIATE NORMAL PROBABILITIES
Satish Iyengar 12 Aug. 1982 81 p refs
(Contract N00014-76-C-0475)
(AD-A119368; SU-TR-322) Avail: NTIS HC A05/MF A01 CSCL 12/1

Consider the following problem: if X is an n-dimensional normally distributed random vector with mean zero and covariance matrix evaluate the probability, pk, that k components of X exceed a given constant. We call (po,...,pn) the exceedance distribution and study its behavior as the covariance matrix varies. The pk's can be expressed as multidimensional integrals; these expressions, however, are not helpful, for simulation and numerical intergration in high dimensions are very expensive. When covariance is an equicorrelation matrix or has single-factor structure, the probabilities can be written as single integrals. In this dissertation, we propose some methods for approximating the above multidimensional integrals by such single integrals. Ample numerical evidence is given to show that the approximations are quite good. We also prove theorem which gives conditions for the variance of the exceedance distribution to be greater than that of the approximation. We use this inequality to improve upon earlier approximations and inequalities. GRA

N83-15014# Stanford Univ., Calif. Dept. of Operations Research.
SOME NEW RESULTS IN REGENERATIVE PROCESS THEORY
Peter W. Glynn Jul. 1982 60 p refs
(Contract N00014-76-C-0578; Grant NSF MCS-79-09139)
(AD-A119153; SU-TR-60) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this report, we investigate various properties of discrete-time regenerative processes (Xn). We start, in Section 2, by defining the concept of a regenerative stochastic process. In Section 3, ergodic theory for weakly regenerative processes is investigated. We prove strong laws for partial sum processes, and show that there exists an ergodic measure, pi which captures all the steady-state information of the process (Xn). Section 4 is concerned with construction of a stationary process from the ergodic measure of Section 3. Total variation convergence of certain measures to pi is studied, in the regenerative setting, in Section 5. Furthermore, rates of convergence, in terms of the moments of the inter-regeneration times, are obtained. These ideas are applied in Section 6 where it is shown that all regenerative processes are strong mixing, and that regenerative processes are uniformly strong mixing (phi-mixing) under a simple sufficient condition. These results allow elementary proofs of some classical mixing results of Davydov (1973) for Markov chains, and improve the results in the sense that estimates for the mixing constants can be obtained. Section 7 studies the central limit theorem (CLT) for weakly regenerative processes; this result can be used to obtain a new CLT for Markov chains; see 20. We also relate this CLT to a CLT for the corresponding stationary process, constructed in Section 4. Finally, in Section 8, we investigate the splitting property of regneration times (see Jacobsen (1974) for the definition of a splitting time) for a special class of Markov chains. GRA

N83-15015# Stanford Univ., Calif. Dept. of Operations Research.
ASYMPTOTIC THEORY FOR NONPARAMETRIC CONFIDENCE INTERVALS
Peter W. Glynn Jul. 1982 51 p refs
(Contract N00014-76-C-0578; Grant NSF MCS-79-09139; NR Proj. 042-343)
(AD-A119196; SU-TR-63) Avail: NTIS HC A04/MF A01 CSCL 12/1

In practice, nonparametric confidence intervals often have undesirable small sample asymmetry and converge characteristics. By applying Edgeworth expansion theory, we obtain asymptotic expansions for the errors associated with nonparametric confidence intervals. This analysis isolates the various elements that contribute to error. We then proceed to develop first and second order corrections to the standard nonparametric interval, which deal with asymmetry problems and coverage difficulties, respectively. Author (GRA)

N83-15016# Brown Univ., Providence, R. I. Div. of Applied Mathematics.
AN INVARIANT MEASURE APPROACH TO THE CONVERGENCE OF STOCHASTIC APPROXIMATIONS WITH STATE DEPENDENT NOISE
Harold J. Kushner and Adam Schwartz Mar. 1982 33 p refs
(Contract N00014-76-C-0279; Grants AF-AFOSR-0116-82; NSF ENG-77-12946; AF Proj. 2304)
(AD-A119195; AFOSR-82-0722TR; LCDS-82-15) Avail: NTIS HC A03/MF A01 CSCL 12/1

A new method is presented for quickly getting the ordinary differential equation associated with the asymptotic properties of a stochastic approximation (or the projected algorithm for the constrained problem). Either a(n) yields 0, or a(n) can be constant, in which case the analysis is on the sequence obtained when a

yields 0.) The method basically requires that the stochastic approximation be Markov with a Feller transition function, but little else. The simplest result requires that if X sub n is equivalent to x, the corresponding noise process have a unique invariant measure; but the 'non-unique' case can also be treated. No mixing condition is required, nor the construction of averaged test functions, and f(.,.) need not be continuous. For the class of sequences treated, the conditions seem easier to verify than for other methods. There are extensions to the non-Markov case. Two examples illustrate the power and ease of use of the approach. Aside from the advantages of the method in treating standard problems, it seems to be particularly useful for handling the type of iterative algorithms which arise in adaptive communication theory, where the dynamics are often discontinuous and the 'noise' is often state dependent due to the effects of feedback. GRA

N83-15017# Stanford Univ., Calif. Dept. of Operations Research.

COVERAGE ERROR FOR CONFIDENCE INTERVALS ARISING IN SIMULATION OUTPUT ANALYSIS

Peter W. Glynn Jun. 1982 16 p refs

(Contract N00014-76-C-0578; Grant NSF MCS-79-09139)

(AD-A119233; SU-TR-59) Avail: NTIS HC A02/MF A01 CSCL 12/1

Coverage error asymptotics for confidence intervals arising in simulation are discussed. Asymptotic expansions, to order 0(n-1) (n is the sample size), are given for confidence intervals associated with sequences of independent and identically distributed random variables, as well as regenerative processes. Implications for simulation are emphasized. Author (GRA)

N83-15018# Stanford Univ., Calif. Dept. of Operations Research.

REGENERATIVE ASPECTS OF THE STEADY-STATE SIMULATION PROBLEM FOR MARKOV CHAINS

Peter W. Glynn Jul. 1982 47 p refs

(Contract N00014-76-C-0578; Grant NSF MCS-79-09139)

(AD-A119232; SU-TR-61) Avail: NTIS HC A03/MF A01 CSCL 12/1

The general discrete-event simulation can be viewed, by using the technique of supplementary variables, as a Markov chain living in a general state space. For such chains, we can define in precise terms, the notion of an associated well-posed steady-state simulation problem. We prove that the concept of well-posedness is equivalent to assuming that the Markov chain has regenerate-type structure. These two conditions are, in turn, equivalent to assuming a certain smoothness on the transition probabilities of the chain. We also consider two examples which illustrate how a chain can fail to have regenerate-type structure. Author (GRA)

N83-15019# San Diego State Univ., Calif. Dept. of Mathematical Sciences.

SIGNAL DETECTION FOR SPHERICALLY EXCHANGEABLE (SE) STOCHASTIC PROCESSES

C. B. Bell Aug. 1982 70 p refs

(Contract N00014-80-C-0208)

(AD-A119521; Rept-4-82) Avail: NTIS HC A04/MF A01 CSCL 20/1

Signal detection problems with spherically exchangeable (Gaussian, conditionally Gaussian, and non-Gaussian) background noise are treated. Techniques for both historical data and cross-sectional data are developed using sufficient statistics and statistical noise. Extensions of the Kolmogorov-Smirnov statistic are employed. Each technique is illustrated by a numerical example. Author (GRA)

N83-15020# RAND Corp., Santa Monica, Calif.

THE RELATION AMONG THE LIKELIHOOD RATIO-, WALD-, AND LAGRANGE MULTIPLIER TESTS AND THEIR APPLICABILITY TO SMALL SAMPLES

Daniel F. Kohler Apr. 1982 13 p refs

(AD-A119471; RAND/P-6756) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper, we show that the Lagrange multiplier test, the likelihood ratio test and the Wald test are monotonic functions of each other. This implies that they have the same power characteristics. If the critical values are specified such as to equate the probabilities of type I error, the probabilities of type II error will be equal as well, and conflicting results are impossible. The critical values of the three tests are related to each other by the same monotonic functions as the three test statistics. The conflicts pointed out in the literature arise only when the exact critical values for each test are replaced by the asymptotically justified critical value of a Chi-square distributions. The extent to which this critical value differs from the exact one varies from test to test. Determining the exact critical values for finite samples is somewhat difficult, because the exact finite sample distributions of the LM and LR test are generally not known. However, under the assumption of normality, the W test can be transformed into an F-test by applying the standard degrees of freedom correction. Futhermore, since the LR and LM tests are functionally related to the W test, they can be transformed into the same test statistic. We can thus conduct an exact finite sample test, based either on the LM, LR or W statistic without running the risk of obtaining conflicting results. GRA

N83-15021# Rensselaer Polytechnic Inst., Troy, N. Y.

SELF-CRITICAL AND ROBUST PROCEDURES FOR THE ANALYSIS OF MULTIVARIATE NORMAL DATA Interim Technical Report

A. S. Paulson and N. J. Delaney 1 Jun. 1982 42 p refs

(Contract DAAG29-81-K-0110)

(AD-A119715; A-4; ARO-18072.4-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

A procecure for performing sensitivity analysis of data vis-a-vis the multivariate error model, with or without structural variables, is proposed. It is based on an estimation procedure, a generalization of maximum likelihood, which is indexed on a user-specified value c. The sensitivity analysis proceeds in the following way: the parameters of a set of data presumed to follow a multivariate normal error model are estimated via maximum likelihood ($c = 0$). The parameters are next estimated for an index $c1 > 0$. The sensitvity in parameter estimates is noted. The parameters are next estimated for a user-specified index $c2 >= c1 > 0$ and the sensitivity of the parameter estimates to the change in c is again noted. This process may have one or more values of $c > 0$. If the parameter estimates are sensitive functions of c, the model and the data are not mutually consistent and both require further detailed study. The items of data which are most contributory to this sensitivity are identified by an examination of observational weights which are a byproduct of the analysis. If the parameters and observational weights are non-sensitive to changes in the index c, then one can generally be confident of the internal consistency of the data and the error model. Fixed values of the index c provide roubust estimation procedures for model parameters. Asymptotic relative efficiencies and influence functions are provided for fixed values of c. The results of a small Monte Carlo study suggest that the asymptotic properties of the estimators are rapidly attined. Several illustrations are given. Author (GRA)

N83-15022# California Univ., Los Angeles. Dept. of Biomathematics.

CONFIDENCE BOUNDS FOR THE EXPONENTIAL MEAN IN TIME-TRUNCATED LIFE TESTS Technical Report, 1 Sep. 1980 - 30 Nov. 1982

Nancy R. Mann, R. E. Schafer, and M. C. Han Sep. 1982 15 p refs

(Contracts N00014-80-C-0684; N00014-82-K-0023)

(AD-A119613) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report concerns interval estimation of the mean of an underlying exponential distribution from a time-truncated, non-replacement life test. Computer methods are developed, and lower confidence bounds are tabulated for a variety of confidence coefficients and sample sizes. GRA

N83-15023# California Univ., Los Angeles. Dept. of Biomathematics.
THE MANN-GRUBBS METHOD
Nancy R. Mann and Frank E. Grubbs Jul. 1982 7 p refs
(Contract N00014-82-K-0023)
(AD-A119616) Avail: NTIS HC A02/MF A01 CSCL 12/1

This article was written for the Encyclopedia of Statistical Sciences, edited by Johnson and Kotz. It describes the Mann-Grubbs method of obtaining confidence bounds on system reliability for the exponential series system, for which it was originally designed, and for other models. Author (GRA)

N83-15024# Rensselaer Polytechnic Inst., Troy, N. Y.
SELF-CRITICAL AND ROBUST ESTIMATES FOR THE PARAMETERS OF THE MULTIVARIATE NORMAL DISTRIBUTION Interim Technical Report
N. J. Delaney and A. S. Paulson 1 Jun. 1982 16 p refs
(Contract DAAG29-81-K-0110)
(AD-A119659; A-3; ARO-18072.3-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

This algorithm yields joint robust estimates of the location vector and the variance-covariance matrix for samples from the multivariate normal distribution. The degree of robustness depends on a single filtering parameter, c, set by the user. The algorithm provides, for each observation, an internally determined weight which may be used to identify potential outliers. GRA

N83-15025# Rensselaer Polytechnic Inst., Troy, N. Y.
SELF-CRITICAL AND ROBUST PROCEDURES FOR THE ANALYSIS OF UNIVARIATE COMPLETE DATA Interim Technical Report
A. S. Paulson, M. A. Presser, and E. H. Nicklin 1 Jun. 1982 38 p refs
(Contract DAAG29-81-K-0110)
(AD-A119724; Rept-A-5; ARO-18072.5-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

A statistical sensitivity analysis may be defined and performed in terms of the response of a vector of parameter estimates to variation in the way sample information is processed vis-a vis to tentative underlying model. The mode of information processing is a generalization of likelihood and is indexed on a non-statistical parameter c. The case c = 0 corresponds to maximum likelihood. If the vector of parameter estimates is stable under moderate increase of the index c from 0, the tentative model and the data are internally consistent. A general procedure for the conduct of such sensitivity analyses is given along with several illustrations. For fixed, positive values of the index, one obtains a general robust estimation procedure. Author (GRA)

N83-15026# State Univ. of New York, Binghamton. Dept. of Mathematical Sciences.
DETERMINING THE PROBABILITY OF AT LEAST ONE SUCCESS IN TRIALS CONDUCTED ON THE LIGHTED PORTION OF A STAR SHAPED CURVE SUBJECT TO A POISSON SHADOWING PROCESS
M. Yadin and S. Zacks 1 Sep. 1982 15 p ref
(Contract N00014-81-K-0407)
(AD-A119735; TR-3) Avail: NTIS HC A02/MF A01 CSCL 12/1

A star shaped curve, C, in the plane is subject to a Poisson shadowing process. According to this process, disks of random size appear at random locations in a region between a source of light, which is at the origin, and the curve C. These disks cast shadows on C. Trials are conducted along the lighted portion of C. Each trail requires a fixed length, l, of C. The different trials are independent and have a fixed probability, p, of success. The number of trials conducted along C is a random variable, N, which depends on the random length of the lighted portion of C. The success probability is P = 1 - (E bracket q to the N bracket), where q = 1 - p. Lower and upper bounds for P are derived. A numerical example shows cases in which these bounds could be very close. Author (GRA)

N83-15027# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ON THE PROPERTY OF DULLNESS OF PARETO DISTRIBUTION
Wing-Yue Wong Jul. 1982 16 p refs
(Contract N00014-75-C-0455)
(AD-A119631; TR-82-16) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the analysis of income distribution, it has been observed that the true income is usually underreported. In this paper we study the statistical prperties of reported incomes through a multiplicative underreported model. The concept of locally nearly dullness of the reported income is introduced and studied. The above property of dullness has been used to characterize the Pareto distribution for the problem of reported incomes.
Author (GRA)

N83-15028# Rensselaer Polytechnic Inst., Troy, N. Y.
SOME MODIFIED INTEGRATED SQUARED ERROR PROCEDURES FOR MULTIVARIATE NORMAL DATA Interim Technical Report
A. S. Paulson and C. E. Lawrence (New York State Health Dept.) 1 Jun. 1982 44 p refs
(Contract DAAG29-81-K-0110)
(AD-A119657; ARO-18072.2-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

A method of estimation for the parameters of the multivariate normal distribution based on the characteristic function (density) and its sample counterpart is given. These M-estimators are dependent on a user-specified parameter. The response of the parameter estimates and observation weights to variation of this user-specified parameter allows a sensitivity analysis of the data and the model considered as a single entity. The estimators have desirable robustness properties, are easy to compute and use, are relatively efficient at the multivariate normal and are useful in identifying potential outliers and problems with the statistical assumptions or the data. The method is extended to include multivariate experimental designs with attention restricted to the two-way cross classification. Several illustrations are provided.
Author (GRA)

N83-15029# Stanford Univ., Calif. Project ORION.
PROJECTION PURSUIT DENSITY ESTIMATION
Jerome H. Friedman, Werner Stuetzle, and Anne Schroeder Jul. 1981 41 p refs
(Contracts N00014-81-K-0340; DE-AC03-76SF-00515; DE-AT03-81ER-10843)
(AD-A119813; ORION-002) Avail: NTIS HC A03/MF A01 CSCL 12/1

The projection pursuit methodology is applied to the multivariate density estimation problem. The resulting nonparametric procedure is often less biased than kernel and near neighbor methods and does not require the specification of a metric on the data measurement space. In addition, graphical information is produced that can be used to help gain geometric insight into the multivariate data distribution. Author (GRA)

N83-15030# Stanford Univ., Calif. Project ORION.
AN INTRODUCTION TO REAL TIME GRAPHICAL TECHNIQUES FOR ANALYZING MULTIVARIATE DATA
Jerome H. Friedman, John Alan McDonald, and Werner Stuetzle Mar. 1982 19 p refs
(Contracts N00014-81-K-0340; DAAG29-82-K-0056; DE-AC03-76SF-00515; DE-AT03-81ER-10843)
(AD-A119815; ORION-009) Avail: NTIS HC A02/MF A01 CSCL 12/1

Orion I is a graphics system used to study applications of computer graphics, especially interactive motion graphics, in statistics. Orion I is the newest of a family of 'Prim' systems, whose most striking common feature is the use of real-time motion graphics to display three dimensional scatterplots. Orion I differs from earlier Prim systems through the use of modern and relatively inexpensive raster graphics and microprocessor technology. It also delivers more computing power to its user; Orion I

can perform more sophisticated realtime computations than were possible on previous such systems. We demonstrate some of Orion I's capabilities in our film: Exploring Data with Orion I.
Author (GRA)

N83-15031# Educational Testing Service, Princeton, N. J.
SAMPLING VARIANCES AND COVARIANCES OF PARAMETER ESTIMATES IN ITEM RESPONSE THEORY
Frederic M. Lord and Marilyn S. Wingersky Aug. 1982 50 p refs
(Contract N00014-80-C-0402; NR Proj. 150-453)
(AD-A119609; ETS-RR-82-33-ONR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper develops a possible method for computing the asymptotic sampling variance-covariance matrix of joint maximum likelihood estimates in item response theory when both item parameters and abilities are unknown. For a set of artificial data, results are compared with empirical values; also with the variance-covariance matrices found by the usual formulas for the case where the abilities are known, or where the item parameters are known. The results are consistent with the conjecture that the new method is asymptotically correct except for errors due to grouping. Author (GRA)

N83-15032# Commission of the European Communities, Ispra (Italy). Joint Research Centre.
MONTE CARLO CALCULATION OF SENSITIVITY COEFFICIENTS
W. Matthes 1981 26 p refs
(DE81-700741; EUR-7148) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A Monte Carlo procedure is presented which allows the evaluation of a complete sensitivity matrix r/sub ilambda/(= delta r/sub i//deltap/sub lambda/; i numbers the counting rates, lambda the system-parameters) playing a normal (unperturbed) game only. The essential points are: (1) a normal game for the unperturbed system is played according to given transport and collision kernels; (2) the running particle carried a weight - vector with as many components as we have derivatives plus one; (3) during transport and at each collision the weight-vector becomes modified by a weight-matrix; and (4) at each collision point a contribution to the counting rate and its derivatives of each detector is evaluated separately. DOE

N83-15033# Technische Hogeschool, Eindhoven (Netherlands). Measurement and Control Group.
INFORMATION THEORY AND IDENTIFICATION
M. E. Ponomarenko (Kiev Polytech. Inst.) Nov. 1981 127 p refs Sponsored by Netherlands Ministry of Education and Sciences and USSR Special Secondary Education
(EUT-81-E-122; ISBN-90-6144-122-6) Avail: NTIS HC A07/MF A01

The properties of several information measures and their relation to Shannon entropy are discussed, including measures of uncertainty, divergence inaccuracy and certainty. Parametric and nonparametric statistical models are distinguished, and it is shown that nonparametric information models can be extended to parametric distributions, whereas parametric models lose their modelling value when losing the unknown parameters. An extension of the maximum entropy principle to parametric statistical models results in a modified decision rule termed minimum information principle, based on the Fisher measure of information. Several formulations of the information theoretical estimation principle are given and contributions to traditional problems of estimation (prediction, filtering, smoothing) and identification made by this principle are discussed. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N83-15034# Stanford Univ., Calif. Dept. of Operations Research.
STATISTICAL EFFICIENCY OF REGENERATIVE SIMULATION METHODS FOR NETWORKS OF QUEUES
Donald L. Iglehart and Gerald S. Shedler May 1982 26 p refs (Contract N00014-76-C-0578; Grant NSF MCS-79-09139)
(AD-A119154; SU-TR-58) Avail: NTIS HC A03/MF A01 CSCL 12/1

When developing simulation methodology, it is important to be able to assess the statistical efficiency of proposed estimation procedures. This paper is concerned with the assessment of the statistical efficiency of regenerative methods for simulation of networks of queues with general service times. Our estimation procedures are applicable to networks that have a single state for passage times; regenerative cycles are defined in terms of the single state. We provide a comparison of two methods for estimation of passage time characteristics in closed networks with priorities among job classes. Passage times(informally the times for a job to traverse a portion of a network) are important in computer and communication system models where they represent job response times. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N83-15035# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
A RECEPTANCE FORMULA FOR GENERAL SECOND DEGREE SQUARE LAMBDA MATRICES
Alan B. Palazzolo, Bo Ping Wang, and W. D. Pilkey 1982 33 p refs Original document was announced as A82-37657
(Contract N00014-75-C-0374)
(AD-A119643; A-82-5) Avail: NTIS HC A03/MF A01 CSCL 12/1

A computational algorithm utilizing the free vibration modes of a structure is presented for calculating receptances. The usual eigen-system computed for large structural models is incomplete; hence the receptances are approximate. The formulas developed here increased receptance accuracy compared to classical spectral representations. Receptances are used extensively in eigensolution reanalysis, design and synthesis and also for forced harmonic response studies. In these areas receptance approaches offer a popular alternative to Rayleigh Ritz subspace type methods. Structural models represented by non-symmetric mass, damping and stiffness matrices, which occur frequently in rotating structures, may be treated using the receptance formulas presented. The receptance matrix derived is applicable to general, 2nd degree, square lambda matrices. This generalizes the receptance matrix commonly associated with matrix pencils. Author (GRA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N83-15036# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A BRIEF HISTORY OF PHYSICS IN CHINA
Dai Nian Zao 29 Jul. 1982 27 p Transl. into ENGLISH from Wuli (China), v. 10, no. 10, Oct. 1981 p 632-639
(AD-A118932; FTD-ID(RS)T-0751-82) Avail: NTIS HC A03/MF A01 CSCL 05/2

A history of physics in China from anicient times to 1900 is given. Heat, electricity, magnetism, light, and sound are among the topics discussed. R.J.F.

N83-15037*# College of William and Mary, Williamsburg, Va. Dept. of Physics.

COMPUTATION OF INVERSE MAGNETIC CASCADES
David Montgomery Oct. 1981 19 p refs Presented at the US/Japan Workshop on 3D MHD Studies for Toroidal Devices, Oak Ridge, Tenn., 19 Oct. 1981
(Grant NsG-7416; Contract W-7405-eng-26)
(NASA-CR-169686; NAS 1.26:169686; DE82-002770; CONF-8110101-1) Avail: NTIS HC A02/MF A01 CSCL 20J

Inverse cascades of magnetic quantities for turbulent incompressible magnetohydrodynamics are reviewed, for two and three dimensions. The theory is extended to the Strauss equations, a description intermediate between two and three dimensions appropriate to Tokamak magnetofluids. Consideration of the absolute equilibrium Gibbs ensemble for the system leads to a prediction of an inverse cascade of magnetic helicity, which may manifest itself as a major disruption. An agenda for computational investigation of this conjecture is proposed. DOE

N83-15038# California Univ., Livermore. Lawrence Livermore Lab.
ANALYSIS AND DESIGN OF SHORT, IRON-FREE DIPOLE MAGNETS
Arthur R. Harvey 21 Oct. 1981 6 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003122; UCRL-85966; CONF-811040-80) Avail: NTIS HC A02/MF A01

Iron-free, dipole magnets are used extensively as steering magnets to correct for the bending, induced by extraneous magnetic fields, of particle beams that are being transported in vacuum. Generally, the dipoles are long enough that the space occupied by the end conductors is small compared to the overall magnet length. In a recent application, however, this criteria did not apply. This has motivated a reanalysis of the characteristics of a system of small aspect ratio (length/diameter) dipoles that are spaced at relatively large axial distances. DOE

N83-15039# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. for Theoretical Physics.
PION FORM FACTOR BEYOND THE LEADER ORDER OF PERTURBATIVE QCD
F. M. Dittes and A. V. Radyushkin 1980 19 p refs Submitted for publication
(JINR-E-2-80-688) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The results of the calculations of the 1-loop corrections to the pion form factor in QCD are presented. Their dependence on the pion wave function and on a particular choice of muon sub (R), the argument of the effective coupling constant a sub (s) (muon sub (R)) are investigated. It is shown that to avoid an unjustified growth of the a sub (s)-corrections one should take muon sub (R) sup (2) of the same order as the average virtuallness of internal lines of the corresponding Feynman diagrams. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N83-15040*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.
PROPAGATION OF SOUND THROUGH THE EARTH'S ATMOSPHERE Progress Report, 1 Jul. - Dec. 1982
Francis Badavi, Roger Meredith, and Jacob Becher Dec. 1982 23 p
(Grant NAG1-234)
(NASA-CR-169630; NAS 1.26:169630; TR-PTR-82-17) Avail: NTIS HC A02/MF A01 CSCL 20A

The infrasonic signatures generated by the main blade slap rate of a helicoper were used in an effort to detect infrasound generated by clear air turbulence. The artificially produced infrasound and the response of the data acquisition system used are analyzed. Flight procedures used by the pilot are described and the helicopter flight information is tabulated. Graphs show the relative frequency amplitudes obtained at various microphone locations. A.R.H.

N83-15041*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
TURBOFAN NOISE GENERATION. VOLUME 1: ANALYSIS
C. S. Ventres, M. A. Theobald, and W. D. Mark Jul. 1982 123 p refs
(Contract NAS3-21252)
(NASA-CR-167952; NAS 1.26:167952; Rept-4770) Avail: NTIS HC A06/MF A01 CSCL 20A

Computer programs were developed which calculate the in-duct acoustic modes excited by a fan/stator stae operating at subsonic tip speed. Three noise source mechanisms are included: (1) sound generated by the rotor blades interacting with turbulence ingested into, or generated within, the inlet duct; (2) sound generated by the stator vanes interacting with the turbulent wakes of the rotors blades; and (3) sound generated by the stator vanes interacting with the mean velocity deficit wakes of the rotor blades. The fan/stator stage is modeled as an ensemble of blades and vanes of zero camber and thickness enclosed within an infinite hard-walled annular duct. Turbulence drawn into or generated within the inlet duct is modeled as nonhomogeneous and anisotropic random fluid motion, superimposed upon a uniform axial mean flow, and convected with that flow. Equations for the duct mode amplitudes, or expected values of the amplitudes, are derived. A.R.H.

N83-15042*# Southwest Research Inst., San Antonio, Tex.
DESIGN AND TEST OF AIRCRAFT ENGINE ISOLATORS FOR REDUCED INTERIOR NOISE Final Report
James F. Unruh and Dennis C. Scheidt Dec. 1982 118 p refs
(Contract NAS1-14861)
(NASA-CR-166021; NAS 1.26:166021; SRI-06-4860) Avail: NTIS HC A06/MF A01 CSCL 20A

Improved engine vibration isolation was proposed to be the most weight and cost efficient retrofit structure-borne noise control measure for single engine general aviation aircraft. A study was carried out the objectives: (1) to develop an engine isolator design specification for reduced interior noise transmission, (2) select/design candidate isolators to meet a 15 dB noise reduction design goal, and (3) carry out a proof of concept evaluation test. Analytical model of the engine, vibration isolators and engine mount structure were coupled to an empirical model of the fuselage for noise transmission evaluation. The model was used to develop engine isolator dynamic properties design specification for reduced noise transmission. Candidate isolators ere chosen from available product literature and retrofit to a test aircraft. A laboratory based test procedure was then developed to simulate engine induced noise transmission in the aircraft for a proof of concept evaluation test. Three candidate isolator configurations were evaluated for reduced structure-borne noise transmission relative to the original equipment isolators. Author

N83-15043*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
STUDY OF THE DAMPING CHARACTERISTICS OF GENERAL AVIATION AIRCRAFT PANELS AND DEVELOPMENT OF COMPUTER PROGRAMS TO CALCULATE THE EFFECTIVENESS OF INTERIOR NOISE CONTROL TREATMENT, PART 1 Progress Report
R. Navannethan, Jim Hunt, and Brian Quayle Dec. 1982 103 p refs
(Contract NCC1-6)
(NASA-CR-169534; NAS 1.26:169534; KU-FRL-417-19) Avail: NTIS HC A06/MF A01 CSCL 20A

Tests were carried out on 20 inch x 20 inch panels at different test conditions using free-free panels, clamped panels, and panels as installed in the KU-FRL acoustic test facility. Tests with free-free panels verified the basic equipment set-up and test procedure. They also provided a basis for comparison. The results indicate that the effect of installed panels is to increase the damping ratio at the same frequency. However, a direct comparison is not

possible, as the fundamental frequency of a free-free panel differs from the resonance frequency of the panel when installed. The damping values of panels installed in the test facility are closer to the damping values obtained with fixed-fixed panels. Effects of damping tape, stiffeners, and bonded and riveted edged conditions were also investigated. Progress in the development of a simple interior noise level control program is reported. A.R.H.

N83-15044*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ACOUSTIC GROUND IMPEDANCE METER Patent Application
Allan J. Zuckerwar, inventor (to NASA) Filed 24 Nov. 1982 14 p
(NASA-Case-LAR-12995-1; US-Patent-Appl-SN-444150) Avail: NTIS HC A02/MF A01 CSCL 20A

A method and apparatus for measuring the acoustic impedance of a surface are described in which the surface is used to enclose one end of the chamber of a Helmholz resonator. Acoustic waves are generated in the neck of the resonator by a piston driven by a variable speed motor through a cam assembly. The acoustic waves are measured in the chamber and the frequency of the generated acoustic waves is measured by an optical device. These measurements are used to compute the compliance and conductance of the chamber and surface combined. The same procedure is followed with a calibration plate having infinite acoustic impedance enclosing the chamber of the resonator to compute the compliance and conductance of the chamber alone. Then by subtracting, the compliance and conductance for the surface is obtained. NASA

N83-15045# Washington State Univ., Pullman. Dept. of Physics.
GLORY AND RAINBOW ENHANCED ACOUSTIC BACKSCATTERING FROM FLUID SPHERES: MODELS FOR DIFFRACTED AXIAL FOCUSING Technical Report, 1 Jul. 1981 - 31 Aug. 1982
Philip L. Marston and Dean S. Langley 1 Sep. 1982 57 p refs
(Contract N00014-80-C-0838)
(AD-A119369; TR-2) Avail: NTIS HC A04/MF A01 CSCL 20/1

Transmitted-wave contributions to backscattering from large fluid spheres are calculated. Amplitudes due to glory rays are enhanced, relative to those of axial reflections, because of focusing. The glory pressure amplitudes are proportional to a2(ka)1/2 where a is the sphere's radius and k is the wavenumber. The model, though similar in form to one for optical scattering from air bubbles contains new features to facilitate the summing of amplitudes in a range of angles. An additional enhancement due to rainbow focusing is modeled for certain sound velocity ratios M; for these M the backscattered amplitude is proportional to a2(ka)2/3. Major features of the exact scattering are reproduced by these models when ka = 1000 and (with defects) ka = 100. The enhancements are not intrinsically due to resonance. Applications to the design of passive sonar targets are noted. Author (GRA)

N83-15046# Stanford Univ., Calif. Physics Lab.
ACOUSTIC MICROSCOPY AT CRYOGENIC TEMPERATURES Annual Summary Report, 1 Jul. 1981 - 30 Jun. 1982
C. F. Quate and J. S. Foster Aug. 1982 15 p refs
(Contract N00014-77-C-0412)
(AD-A119705; SU-GL-3841) Avail: NTIS HC A02/MF A01 CSCL 17/1

This report described our progress on very high resolution acoustic microscopy in very low temperature liquid helium. During the past year we have recorded the first acoustic images at temperatures less than .2 K. The acoustic wavelength in helium was 2400 A, which was the shortest ever used in acoustic imaging. After several improvements to the microscope were made, the helium acoustic wavelength was reduced to 900 A and images recorded with sub-1000 A resolution. Author (GRA)

N83-15047# Naval Research Lab., Washington, D. C.
SOLVING THE PARABOLIC EQUATION FOR UNDERWATER ACOUSTIC PROPAGATION BY THE SPLIT-STEP ALGORITHM Interim Report
L. F. Roche 30 Aug. 1982 29 p refs
(RR0110843)
(AD-A119750; NRL-8607) Avail: NTIS HC A03/MF A01 CSCL 20/1

Mathematical models of underwater acoustic propagation are used in designing, deploying, and using underwater acoustic surveillance systems. This report documents a package of computer programs which solves the parabolic equation for underwater acoustic propagation using a split-step algorithm. These programs are implemented on the Texas Instruments Advanced Scientific Computer and make use of its pipelining and vectorizing capabilities. They include the ability to partially correct for the errors induced by the parabolic assumptions. All of the programs of this package can plot their outputs. These plots include sound-speed contours, sound-speed profiles, the initial pressure field, transmission loss as a function of range, transmission loss as a function of depth, transmission-loss histograms in specified range-and-depth regions, and intensity contours as a function of range and depth. The report summarizes the theory, describes the implementation, and tells how to run the programs. Author (GRA)

N83-15048# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics
THE ESTIMATION OF THE CYLINDRICAL WAVE REFLECTION COEFFICIENT
Andrew Loris Kurkjian Jul. 1982 193 p refs
(Contract N00014-81-K-0742; Grant NSF ECS-80-07102)
(AD-A119420; TR-495) Avail: NTIS HC A09/MF A01 CSCL 20/1

In the acoustic well logging problem an acoustic source and an array of receivers are placed in a borehole for the purpose of resolving the acoustic properties of the surrounding formation. In the existing approach to this problem, a received array is placed at a large offset from the source and energy refracted by the formation is analyzed. Here, a short-offset array is used to analyze energy reflected by the formation. The formation is modeled as cylindrically stratified and the concepts and properties of the monochromatic cylindrical wave and the cylindrical wave reflection coefficient are developed. The reflection coefficient as a function of frequency, but at a single axial wavenumber, is estimated from the reflected component of the total field on the axis of the borehole. A rapid method for generating arrays of synthetic acoustic logging data is developed and the data is used to test and evaluate the iterative Maximum Likelihood (ML) dereverberation scheme. The reflection coefficient estimates are found to be accurate within the passband of the source pulse except at those frequencies which excite modes. The estimation performance is sensitive to the array design and to the signal-to-noise ratio. GRA

N83-15049# Riso National Lab., Roskilde (Denmark). Metallurgy Dept.
ACCURATE THREE DIMENSIONAL CHARACTERIZATION OF ULTRASONIC SOUND FIELDS (BY COMPUTER CONTROLLED ROTATIONAL SCANNING)
H. E. Gundtoft and T. Nielsen Jul. 1981 14 p ref Presented at the 2nd European Conf. on Non-Destructive Testing, Vienna, 14 Sep. 1981 Previously announced as A82-20108
(DE81-700303; RISO-M-2296; CONF-810989-1;
ISBN-87-550-0773-2; ISSN-0418-6435) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A rotational scanning system was developed which allows sound fields from ultrasonic transducers to be examined in three dimensions. Using different calculation and plotting programs, any section in the sound field can be plotted. Results from examination of transducers for automatic inspection are presented. DOE

N83-15050# Societe Franco-Americaine de Constructions Atomiques, Courbevoire (France). Div. Qualite.
REPRODUCIBILITY OF THE RESULTS IN ULTRASONIC TESTING [REPRODUCTIBILITE DES RESULTATS LORS DES EXAMENS PAR ULTRASONS: APPROCHE STATISTIQUE]
M. Chalaye, J. P. Launay, and A. Thomas Dec. 1980 10 p In

FRENCH Presented at the 3rd Colloq. on the Develop. of Metal Invest. Methods, St.-Etienne, France, 3-5 Dec. 1980
(DE81-700300; FRAMATOME-CONF-28; CONF-801269-2) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The conclusions of the tests carried out in order to evaluate the reproducibility of ultrasonic tests made on welded joints are reported. A study to assess the dispersion of results afforded by the test line and to characterize its behavior was studied. The tests covered sensors and ultrasonic generators and to be identical to each other (same commercial batch). DOE

N83-15051# Centro Informazioni Studi Esperienze, Milan (Italy). Documentation Service.
INTRODUCTION TO ACOUSTIC EMISSION [INTRODUZIONE ALL'EMISSIONE ACUSTICA]
G. Possa 1982 5 p In ITALIAN
(CISE-1792) Avail: NTIS HC A02/MF A01

Typical acoustic emission signal characteristics are described and techniques which localize the signal source by processing the acoustic delay data from multiple sensors are discussed. The instrumentation, which includes sensors, amplifiers, pulse counters, a minicomputer and output devices is examined. Applications are reviewed. Author (ESA)

N83-14513# Minnesota Univ., Minneapolis.
COHERENT STRUCTURE AND JET NOISE
R. E. A. Arndt and D. F. Long *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 10 Oct. 1982 p 3-10 refs (For primary document see N83-14512 05-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375

N83-14853*# Polar Research Lab., Inc., Santa Barbara, Calif.
ARCTIC RESEARCH IN ENVIRONMENTAL ACOUSTICS
Beaumont M. Buck *In* NASA. Goddard Space Flight Center Nimbus 6 Random Access Meas. System Appl. Expt. Oct. 1982 p 56-57 (For primary document see N83-14835 05-47)
Avail: NTIS HC A06/MF A01 CSCL 20A

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N83-15052# Los Alamos Scientific Lab., N. Mex.
MAGNONS AT THE CURIE TEMPERATURE
D. A. Poling 1981 13 p refs Presented at the 27th Ann. Conf. on Magnetism and Magnetic Mater., Atlanta, 10 Nov. 1981
(Contract W-7405-eng-36)
(DE82-002375; LA-UR-81-3106; CONF-811123-2) Avail: NTIS HC A02/MF A01

Random phase approximations (RPA) have successfully treated spin wave excitations in Heisenberg ferromagnets at low temperatures. The role played by magnons at the order-disorder transition is examined in terms of magnons at the Curie temperature and above. Attempts to formulate higher random phase approximations are considered in terms of why they fail as they approach the transition temperature. An attempt is made to eliminate incorrect contributions from the energetically disfavored paramagnetic state to the correct magnon renormalization. DOE

N83-15053# California Inst. of Tech., Pasadena.
ELECTRON, PROTON AND RELATED TRANSFERS
Rudolph A. Marcus 10 Sep. 1982 22 p refs
(Contract N00014-79-C-0009)
(AD-A119385; CONTRIB-6728; TR-13) Avail: NTIS HC A02/MF A01 CSCL 20/8

Past and current developments in electron and proton transfer and in related fields are described. Broad classes of reactions have been considered from a unified viewpoint, which offers a variety of experimental predictions. This introductory lecture considers various aspects of this many-faceted field.Author (GRA)

N83-15054# Hawaii Univ., Honolulu. Dept. of Physics and Astronomy.
ON THE PREDICTION AND APPLICATION OF LOW ENERGY X-RAY INTERACTIONS Progress Report, 1 Oct. 1981 - 30 Sep. 1982
Burton L. Henke Jan. 1982 75 p refs Proceedings of the Low Energy X-ray Phys. Program, Honolulu, Jan. 1982
(Grant AF-AFOSR-0027-79; AF Proj. 2301)
(AD-A119277; AFOSR-82-0691TR) Avail: NTIS HC A04/MF A01 CSCL 20/8

For the low energy X-ray region of 100-2000 eV, the complete atomic interaction, coherent scattering and photoelectric absorption can be described by a complex scattering amplitude which may be given through the atomic scattering factor, f1 + if2. For this low photon energy region, it is shown by the relativistic quantum dispersion theory that the atomic scattering factors can be uniquely determined from simple relations involving only the atomic photoionization cross section dependence upon phonton energy. We have compiled state of the art tables for the photoionization cross sections for 94 elements and for the photon energy region of 30-10,000 eV. With this compilation, we have established atomic scattering factor tables for the 100-2000 eV region. By a summing of the complex, atomic scattering amplitudes, a low energy X-ray interaction can be determined. Even for atoms in the molecular or solid state the scattering cross sectons remain atomic-like except for photon energies very near the thresholds. Using practical examples, the methods of calculation, with the atomic scattering factors, are reviewed here for the following: X-ray energy deposition within materials (energy response of X-ray photocathodes); transmission through a homogeneous medium: refraction; transmission through a random collection of uniform spheres: low angle scattering in an inhomogeneous medium; specular, Fresnel reflection (total and large angle reflection) at smooth boundary; and Bragg reflection from a periodic, layered system--(reflection by crystals and multilayers). Author (GRA)

N83-15055# Naval Research Lab., Washington, D. C.
THE USE OF ION IMPLANTATION FOR MATERIALS PROCESSING Annual Progress Report, 1 Oct. 1980 - 30 Sep. 1981
F. A. Smidt 2 Jul. 1982 205 p refs
(WF61544007; RR0220844)
(AD-A119719; NRL-MR-4821) Avail: NTIS HC A10/MF A01 CSCL 20/8

An interdisciplinary program on the use of ion implantation for materials processing is being conducted at NRL. This report describes the important factors in ion implantation science and technology and reports progress in the use of ion implantation to modify wear, fatigue, corrosion, and optical properties of materials. Author (GRA)

N83-15056# Mission Research Corp., Albuquerque, N. Mex.
MODIFIED BETATRON STABILITY CALCULATIONS Interim Report
Brendan B. Godfrey and Thomas P. Hughes Aug. 1982 15 p refs
(Contract N00014-81-C-0647)
(AD-A119584; AMRC-N-207) Avail: NTIS HC A02/MF A01 CSCL 20/1

Cold beam linear growth rates of the negative mass and resistive wall instabilities in a high current modified betatron have been determined numerically. The resistive wall instability is much slower than the negative mass instability even for large wall resistivities. GRA

N83-15057# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Genie Radioactif.
REPROCESSING OF FAST NEUTRON REACTOR FUEL
M. Bourgeois May 1981 9 p In FRENCH Presented at the meeting on the Nucl. Fuel Cycle, Saclay, France, 5-13 May 1981
(DE81-700650; CEA-CONF-5740; CONF-8105124-1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A PUREX process specially adapted to fast neutron reactor fuels is employed. The results obtained indicate that the aqueous

process can be applied to this type of fuel; almost 10 years operation at the AT I plant which processes fuel from RAPSODIE; the good results obtained at the MARCOULE pilot plant on large batches of reference fuels. The CEA is continuing its work to transfer this technology onto an industrial scale. Industrial prototypes and the launching of the TOR (traitement d'oxydes rapides) project will facilitate this transfer. In 1984, it is expected that fast fuels will be able to be processed on a significant scale and that supplementary R and D facilities will be available. DOE

N83-15058# Grenoble Univ. (France). Lab. de Physique des Particules.
HADRON STRUCTURE FUNCTIONS
F. Martin Mar. 1981 12 p refs Presented at the Drell-yam Workshop/Recontre de Moriond, Les Arcs, Savoie, France, 25-31 Jan. 1981
(DE81-700597; LAPP-TH-32; CONF-810154-2) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The x dependence of hadron structure functions is investigated. If quarks can exist in very low mass states (10 MeV for d and u quarks) the pion structure function is predicted to behave like (1-x) and not (1-x)(2) in an x-region around 1. Relativistic and non-relativistic quark bound state pictures of hadrons are considered together with their relation with the Q(2) evolution of structure functions. Good agreement with data is in general obtained. DOE

N83-15059# Zentralinstitut fuer Kernforschung, Rossendorf bei Dresden (East Germany).
CALCULATION OF ASYMPTOTIC NORMALIZATION PARAMETERS FOR 3-NUCLEON STATES
K. Moeller Mar. 1981 19 p refs
(DE81-700233; ZfK-438) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A method is presented for the calculation of the asymptotic normalization parameters for three-nucleon systems. On the basis of this method the asymptotic normalization parameters for unstable three-nucleon states can be obtained with the same numerical accuracy as for bound states by applying contour deformation technique to solve the homogeneous Faddeev equation. The method was used to calculate the asymptotic normalization parameters for different three-particle states using s-wave separable Yamaguchi two-particle interaction. Dissert. Abstr.

N83-15060# Association Euratom-CEA, Grenoble (France). Dept. de Physique du Plasma et de la Fusion Controlee.
ELECTRON ACCELERATION BY STOCHASTIC WAVE PACKETS
P. Rolland Mar. 1981 38 p refs
(DE81-700154; EUR-CEA-FC-1095) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

An analytical theory for the time evolution of the distribution function, energy and current of an assembly of electrons submitted to a quasi-sinusoidal stochastic field is given. To the first order energy and current are obtained using Sturrock's stochastic acceleration theory. The calculation of the transition probability enables us to get the distortion of the distribution function, and to recover the preceding first order results. To the second order, collisions are taken into account, in the framework of the two dimensional theory. The turn-on time for the current is evaluated. The obtained results are compared with the numerical results of Karney and Fisch. DOE

N83-15061# Commissariat a l'Energie Atomique, Grenoble (France). Service Ionique Generale.
PRODUCTION OF NEGATIVE D- IONS BY DOUBLE CHARGE EXCHANGE ON CESIUM TARGET [PRODUCTION D'IONS NEGATIFS D- PAR DOUBLE ECHANGE DE CHARGE SUR DU CESIUM]
M. Delaunay, R. Geller, C. Jacquot, P. Ludwig, F. Mazhari, J. C. Rocco, P. Sermet, and F. Zadworny Mar. 1981 62 p refs In FRENCH; ENGLISH summary
(DE81-700155; EUR-CEA-FC-1096) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

A D-beam immersed in a high uniform magnetic field was produced by a double charge exchange of D+ in a supersonic cesium target. The average D- current density is 10-12 mA/sq. cm. at 1 KeV energy. It can be extrapolated to 20-25 mA/sq. cm. at 0.3 KeV. The maximum pulse duration is 5 s. A total D- current of 160 mA at 1 KeV is obtained. The main cesium plasma parameters obtained by interferometry and spectrographic measurements are nsub(e) = 1013 e/sq. cm. and Tsub(e) = 0.1 eV. Then the D- detruction mechanisms by the cesium plasma are limited and the total D- conversion efficiency is comparable to the efficiency determined by the cross-sections ratio at low D+ energy. DOE

N83-15062# Melbourne Univ., Parkville (Australia). School of Physics.
L-SHELL IONIZATION BY RELATIVISTIC ELECTRONS
P. N. Johnston, B. M. Spicer, and R. Helstrom 1980 7 p refs (UM-P-80/15) Avail: NTIS (US Sales Only) HC A02/MF A01;DOE Depository Libraries

Measurements of the relative X-ray production cross sections L/sub alpha//L/sub 1/, L/sub beta//L/sub alpha/ and Ls/sub gamma//L/sub alpha/ by relativistic electrons for the heavy elements Gd, Tm, Ta, Au, Pb, Bi and Th have been carried out. The ratios L/sub beta//L/sub alpha/ and L/sub alpha//Ls/sub 1/, are compared with previous experimental and theoretical work. DOE

N83-15063# Brookhaven National Lab., Upton, N. Y.
COMPARISON OF ANTIPROTON-PROTON AND PROTON-PROTON COLLISIONS AT THE CERN INTERSECTING STORAGE RING
A. diCiaccio, H. Gordon, R. Hogue, R. Killian, T. Ludlam, M. Winik, C. Woody, O. Botner, V. Burkert, D. Cockerill et al 1981 22 p refs Presented at the Intern. Conf. on High Energy Phys., Lisbon, 9 Jul. 1981 Prepared in cooperation with CERN, Niels Bohr Inst., Lund Univ., Rutherford Lab. and Tel Aviv Univ.
(Contract DE-AC02-76CH-00016)
(DE82-003677; BNL-30202; CONF-810760-6) Avail: NTIS HC A02/MF A01

A comparative investigation of anti pp and pp collisions at the CERN intersecting storage rings is reported. The cylindrical drift chamber of the axial field spectrometer was used. Non-relativistic particles were identified hrough multiple ionization sampling. The inclusive production of pions, kaons, protons, and antiprotons in the central region of rapidity (absolute value y < 0.8) is compared. Distributions in charged particle multiplicity, rapidity, and p sub T are found to be very similar in anti-pp and pp data. DOE

N83-15064# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Ehnergij.
INCLUSIVE PRODUCTION OF ANTI HYPERONS AND HYPERONS IN K+ p INTERACTIONS AT 32 GeV/c
I. V. Alinenko, Y. A. Belokopitov, P. V. Chliapnikov, L. N. Gerdyukov, V. V. Kniazev, A. I. Kurnosenko, A. K. Likhoded, V. M. Perevoztchikov, V. N. Riadovikov, A. M. Rybin et al 1980 16 p refs In ENGLISH; RUSSIAN summary Submitted for publication (IHEP-OEIPK/SERP-E-80-24-78) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The inclusive production of anti E(+) and E(-) hyperons is investigated in K(+) p interactions at 32 GeV/c. The production cross sections 36.4 + or - 9 mb for the anti Ē(+) and 6.5 + or - 3 mb for the E(-) are rising strongly with energy similarly to anti delta and delta(-) production in K(+) p interactions. The anti E(+) are produced preferentially in the forward direction in the c.m. system, while the E(-) are produced dominantly backward. The average transverse momenta < p/sub T/> /sub anti E/sup +//=0.73 + or - 0.09 GeV/c and < p/sub T/> / sub E/sup-// =0.58 + or 0.09 GeV/c. DOE

N83-15065# Lund Univ. (Sweden). Fysiska Inst.
MONTE CARLO SIMULATION OF DISTRIBUTIONS OF RECOILING PROTONS IN HIGH ENERGY HADRON-NUCLEUS REACTIONS

B. Andersson, S. I. A. Garpman, G. Nilsson, I. Otterlund, and K. B. Bhalla (Rajasthan Univ.) Dec. 1980 20 p refs
(LUIP-8010; LU-TP-80-13; LUNFD6/(NFFK-8010)1-12(1980); ISSN-0348-9329) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A Monte Carlo simulation of the multiplicity and angular distributions of recoiling protons in high energy hadron-nucleus reactions is discussed. DOE

N83-15066# Melbourne Univ., Parkville (Australia). School of Physics.
INTERPRETATION OF ENHANCEMENTS IN THE ANTIPROTON-NEUTRON FROM ANTIPROTON-DEUTERON ANNIHILATIONS
L. J. Martin, G. C. Mason, G. I. Opat, G. Chapman, J. DeRoach, P. Kasper, A. G. Klein, K. R. Parker, S. N. Tovey, and J. W. G. Wignall 1980 16 p refs
(UM-P-80/5) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Data are presented from a low energy antiproton-Deuteron experiment that show an enhancement near 1930 MeV in the anti-proton-neutron mass spectrum. This, and other enhancements observed at nearby masses, may be interpreted in terms of a double scattering effect. DOE

N83-15067# Melbourne Univ., Parkville (Australia). School of Physics.
HADRONIC TRANSITIONS FOR HEAVY QUARKONIA IN THE O-MESON MODEL
C. I. Belyea and G. C. Joshi 1980 15 p refs
(UM-P-80/8) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Using the O-meson model, predictions are made for the rates of psi''(4.032) yields psi pion pion, and psi'''(4.414) yields psi pion pion. It is found that psi'' and psi''' should have significant branching ratios of psi pion pion. With a broken SU(5) symmetry scheme, extrapolation is made to the Upsilons and it is found that the decays of UPSILON'' should be dominated by the two pion transition UPSILON'' yields UPSILON pion pion, contrary to other predictions. The scaling behavior of two pion transitions is examined, assuming a logarithmic quark-antiquark potential. It is also predicted that transitions of the form V' yields Vn should be insignificant for the Upsilons. DOE

N83-15068# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.
QCD SUM RULES OF THE LAPLACE TRANSFORM TYPE AND LIGHT QUARK MASSES
Stephan Narison (International Center for Theoretical Physics) and Eduardo deRafael Apr. 1981 9 p refs
(DE81-700140; CNRS-CPT-81-P-1287) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The relation is discussed between the usual dispersion relation sum rules and the Laplace transform type sum rules in quantum chromodynamics. Two specific examples corresponding to the S coupling constant sum rule and the light quark masses sum rules are considered. An interpretation, within QCD, of Leutwyler's formula for the current algebra quark masses is also given. DOE

N83-15069# Paris Univ., Orsay (France). Inst. de Physique Nucleaire.
TOPOLOGICAL SUPERSYMMETRIC STRUCTURE OF HADRON CROSS SECTIONS
P. Gauron, B. Nicolescu, and S. Ouvry Dec. 1980 60 p refs
(DE81-700596; IPNO-TH-80-58) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

Recently a way of fully implementing unitarity in the framework of a Dual Topological Unitarization theory, including not only mesons but also baryons, was found. This theory consists in the topological description of hadron interactions involving confined quarks in terms of two 2 dimensional surfaces (a closed quantum surface and a bounded classical surface). We show that this description directly leads, at the zeroth order of the topological expansion, to certain relations between hadron cross sections, in nice agreement with experimental data. A new topological suppression mechanism is shown to play an important dynamical role. We also point out a new topological supersymmetry property, which leads to realistic experimental consequences. A possible topological origin of the rho and omega universality relations emerges as a by product of our study. DOE

N83-15070# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Centre d'Etudes Nucleaires de Saclay.
ELECTRO- AND PHOTONUCLEAR PHYSICS AT INTERMEDIATE ENERGIES: SACLAY ACTIVITIES SINCE 1970 AND FUTURE PROSPECTS
C. Schuhl Jun. 1981 25 p refs Presented at the 5th Seminar on Electromagnetic Interactions of Nuclei at Low and Medium Energies, Moscow, 15 Jun. 1981
(DE81-700613; CEA-CONF-5772; CONF-8106173) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A review of experiments performed at the 600 MeV electron linear accelerator with electron, photon, pion and muon beams is reported and the long range prospects for nuclear physics in that domain are shown. DOE

N83-15071# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
EQUIVALENCE OF QUADRUPOLE PHONON MODEL AND INTERACTING BOSON MODEL
G. Kyrchev 1980 20 p refs In ENGLISH; RUSSIAN summary Submitted for publication
(JINR-E-4-80-178) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A rigorous proof of the quadrupole phonon model (QPM) and the interacting boson model (IBM) equivalence (the Hamiltonians and the relevant operators of both models are identical) is presented. Within the theory of classical Lie algebras the Schwinger representation (SR) construction of SU(6)-algebra, generated by QPM collective coordinates, conjugated momenta and their commutators, is given. Having the explicit form of SU(6) generators in SR, one gets the QPM collective Hamiltonian in SR. The Hamiltonian of QPM thus obtained contains all Boson structures, which are present in the Hamiltonian of IBM and under definite relations between their parameters, both Hamiltonians coincide identically. The relevant operators are identical too. Thus, though QPM and IBM, being advanced independently, were developed in a different fashion, they are essentially equivalent. DOE

N83-15072# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
DEFORMATION PROPERTIES OF OSMIUM, PLATINUM, MERCURY ISOTOPES FROM SELF-CONSISTENT CALCULATIONS: INFLUENCE OF THE PAIRING TREATMENT
J. Sauvage-Letessier, P. Quentin, and H. Flocard 1981 51 p
(DE81-700603; IPNO-TH-81-19) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The deformation properties of several isotopes of the elements Os, Pt and Hg have been computed by means of Hartree-Fock plus BCS calculations. The Hartree-Fock potential was derived from the Skyrme interaction S III. Two approximations have been used for the treatment of pairing correlations: the constant gap method and the constant pairing matrix element method. A good agreement with experiment data is obtained for ground state deformation properties except for the exact location of the prolate-oblate transition as a function of the neutron number. For one nucleus 184Hg, the pairing matrix elements were calculated from the Gogny interaction D1, to study their single particle state and deformation dependence. The validity of the two approximations used for pairing correlations, is discussed. GRA

N83-15073# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Dept. de Physique Nucleaire.
FAST FISSION PHENOMENON: AN INTERMEDIATE MECHANISM BETWEEN COMPOUND NUCLEUS FORMATION AND DEEP INELASTIC REACTIONS
C. Ngo, C. Gregoire, and B. Remaud May 1981 13 p refs

Presented at the Adriatic Europhys. Study on Nucl. Phys. Dyn. of Heavy-Ion Collisions Conf., Croatis, Yugoslavia, 25-30 May 1981
(DE81-700611; CEA-CONF-5751; CONF-10563-11) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The condition under which fast fission can be observed are discussed. The critical angular momentum for fusion which can be larger than the value of the angular momentum for which the fission barrier of the compound nucleus vanishes and the large increase of the FWHM of the symmetric fragmentation mass distribution which strongly increases with angular momentum was reviewed. A dynamic model which treats both dissipation and fluctuations for the collective motions is presented. This model allows to compute deep inelastic properties and the fusion cross section. For some systems, a new type of dissipative collision appears which is the fast fission phenomenon. This process is intermediate between deep inelastic reactions and compound nucleus formation. GRA

N83-15074# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. d'Etudes des Combustibles a Base de Plutonium.
DIFFUSE SCATTERING OF NEUTRONS
C. H. deNovion Feb. 1981 48 p refs In FRENCH Presented at a School on the Use of Neutrons in Met., Aussois, France, 23 Jan. - 1 Feb. 1981
(DE81-700572; CEA-CONF-5651; CONF-810159-1) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The use of neutron scattering to study atomic disorder in metals and alloys is described. The diffuse elastic scattering of neutrons by a perfect crystal lattice leads to a diffraction spectrum with only Bragg spreads. The existence of disorder in the crystal results in intensity and position modifications to these spreads, and above all, to the appearance of a low intensity scatter between Bragg peaks. The elastic scattering of neutrons is treated by measuring the number of scattered neutrons having the same energy as the incident neutrons. Such measurements yield information on the static disorder in the crystal and time average fluctuations in composition and atomic displacements. DOE

N83-15075# Chalmers Univ. of Technology, Goteborg (Sweden). Inst. foer Reaktorfysik.
SOLUTION OF THE DISPERSION EQUATION FOR MONOENERGETIC NEUTRON TRANSPORT WITH QUADRADICALLY ANISOTROPIC SCATTERING
N. G. Sjoestrand and V. Protopopescu Jun. 1981 26 p refs
(DE81-700221; CTH-RF-36) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A previous treatment of the eigenvalues occurring in the stationary or time dependent monoenergetic Boltzmann equation with linearly anisotropic scattering is extended to include also quadratic anisotropy. The similarities and differences between the stationary and time dependent problems are discussed. For the stationary case a systematization is made (partly based on the work by Dawn, et al.), which facilitates the determination of the number and type of roots to the dispersion equation for any combination of linear and quadratic anisotropy. Based upon this, the stationary problem is discussed in detail for b1 = 0 and + - 1 third and the time dependent problem for b1 = 0 and 1 third. DOE

N83-15076# Commissariat a l'Energie Atomique, Villeneuve-Saint-Georges (France). Centre d'Etudes de Limeil.
ENERGETIC CHARGED PARTICLES SLOWING DOWN
D. Besnard May 1981 14 p refs Presented at the Intern. Conf. on Plasma Sci., Sante Fe, N. Mex., 18-20 May 1981
(DE81-700582; CEA-CONF-5780; CONF-810527-9) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The slowing down of energetic charged particles and their interaction with the plasma they are crossing was studied with the help of a new numerical method. Besides, rapidity and accuracy are advantages of this method, which could make it prefered to Monte Carlo type methods in many cases. DOE

N83-15077# Lund Univ. (Sweden). Dept. of Physics.
RELATIVISTIC ALPHA-PARTICLES EMITTED IN Fe-EMULSION INTERACTIONS
K. B. Bhalla, M. Chaudhry, S. Lokanathan, R. K. Grover, I. K. Daftari, L. L. Mangotra, N. K. Rao, S. I. A. Garpman, and I. Otterlund Feb. 1981 26 p refs Prepared in cooperation with Rajasthan Univ. and Jammu Univ. Sponsored in part by Uppsala Univ., the Indian University Grants Commission and the National Science Research Council of Sweden
(LUIP-8101; LUNFD6/(NFFK-7008)1-17(1981); ISSN-0348-9329) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Relativistic alpha particles were studied in 423 Fe-emulsion interactions at 1.7 A Gev. Comparisons of the observed angular distribution with that from (16)O-emulsion reactions at 2.1 A GeV reveal that more alpha particles are observed at large angles in the Fe-emulsion reactions. The alpha particles with large angles cannot be explained by fragmentation from a clean cut spectator. Comparison of the experimental data with moving relativistic Boltzmann distributions shows that a single Boltzmann distribution cannot fit the fragmentation peak and the tail simultaneously. A thermal source (fireball) explaining the tail part of the distribution needs to be formed by a mechanism other than simple clean cut participant-spectator picture. A large transverse momentum transfer to spectator before fragmentation may explain the tail. DOE

N83-15078# Melbourne Univ., Parkville (Australia). School of Physics.
LOW ENERGY NEUTRON SCATTERING FROM 12C AND NUCLEAR SPECTROSCOPY
L. Rikus and K. Amos 1980 29 p refs
(UM-P-80/18) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Low energy neutron elastic scattering from C-12 below the first inelastic threshold is analyzed using a single channel R-matrix theory to test low excitation, p-s-d shell model spectroscopy of C-12, C-13. DOE

N83-15079# Melbourne Univ., Parkville (Australia). School of Physics.
INTERMEDIATE GIANT RESONANCE EXCITATION EFFECTS IN DIRECT REACTION (p,2p) CORRELATIONS
K. Amos, I. Morrison, and R. Smith 1980 47 p refs Prepared in cooperation with the Australian National Univ.
(UM-P-80/26) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The transition amplitude for (p,2p) reactions initiated by protons with energies in excess of 100 MeV is cast into a form which facilitates identification of components associated with the standard (direct) knockout mechanism, and with semi-direct processes in which excited states of the target, notably the giant resonances, mediate the transitions. Calculations of both direct and semi-direct amplitudes are presented, for the C-12(p,2p) reaction, in an asymmetric energy sharing geometry for which a half distorted wave approximation is appropriate. Estimates of the semi-direct effects, using coupling strengths deemed appropriate from analyses of C-12(p,p) data, indicate that under favorable kinematic conditions such effects should be discernable in correlations. DOE

N83-15080# Paris Univ., Orsay (France). Inst. de Physique Nucleaire.
HIGH-LYING EXCITATIONS IN NUCLEI
S. Gales 1981 69 p refs Presented at the Course on Nucl. Structure Studies by Means of Nucl. Reactions, Mikolajki, Poland, 2-13 Sep. 1980
(DE81-700626; IPNO-PhN-81-05; CONF-8008134-1) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The characteristics of highly excited states in medium-heavy nuclei are illustrated using the single and two particle strength functions deduced from the analysis of neutron pick-up reactions to deep-hole states. The experimental neutron-hole strengths are

compared to the theoretical predictions of the quasi particle-phonon and to the single-particle vibration nuclear models. Recent measurements of J for inner-hole states Zr-89 and Sn-115, Sn-119 using the analyzing power of the (p,d) and (d,t) are reported. The higher isospin components of single particle strength distributions are investigated via transfer reactions to unbound isobaric analog states. The proton decay of isobaric analog states are observed in the study of the (He-3 alpha p) and (He,-3,dp) sequential processes. The selectivity of this decay channel is used to populate particle-hole or hole-hole multiplets in the residual nuclei. DOE

N83-15081# Melbourne Univ., Parkville (Australia). School of Physics.
VARIETY OF INFORMATION INHERENT IN NUCLEAR (p,2p) REACTION ANALYSES
K. Amos 1980 17 p refs
(UM-P-80/6) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Nuclear reaction theory for (p,2p) reactions is reviewed in general to show how and what type of information about nuclear spectroscopy and nuclear reaction mechanisms (the two nucleon t-matrix in particular) is inherent in reaction data. The results of various model calculations are shown to illustrate what information has been and what information might yet be extracted from pertinent analyses of appropriate data. Author

N83-15082# Paris Univ., Orsay (France). Inst. de Physique Nucleaire.
POSSIBLE MECHANISM IN HEAVY ION INDUCED REACTIONS: FAST FISSION PROCESS
B. Borderie, D. Gardes, M. Berlanger (Brussels Univ.), F. Hanappe (Brussels Univ.), L. Nowicki (Inst. of Nuclear Research, Swierk, Poland), J. Peter, B. Tamain, S. Agarwal, J. Girard, C. Gregoire et al 1980 30 p refs Prepared in cooperation with C.E.A.
(IPNO-RC-80-07) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The influence of the orbital angular momentum 1 on the mass distribution of fission fragments is studied, both on previously available data on heavy ion induced fission and in new specifically planned experiments: systems Ar-40 + Ho-165 and Mg-24 + Ta-81 at bombarding energies ranging from 180 up to 391 MeV and leading to the same fissioning nucleus At-205 with different 1 distributions. When 1 values corresponding to a vanished fission barrier are reached, the mass distribution broadens. This suggest the existence of a specific process, fast fission, at 1-values leading to compound nucleus formation and deep inelastic collisions, respectively. This process and its conditions of occurrence are discussed; of special interest are the correlated differences between the limitations to the fission cross-section and the fission mass distributions broadenings, respectively, for the Ar + Ho and Mg + Ta systems. DOE

N83-15083# Brookhaven National Lab., Upton, N. Y.
EXPERIMENTAL LIMITS ON NEUTRINO OSCILLATORS
N. J. Baker, P. L. Connolly, and S. A. Kahn 1981 6 p refs Presented at Intern. Conf. on Neutrion Phys. and Astrophys., Maui, Hawaii, 1 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE82-001807; BNL-30081; CONF-810767-1) Avail: NTIS HC A02/MF A01

Neutrino oscillations were sought in a wideband neutrino beam at Fermilab using the 15-foot bubble chamber. No evidence was found for neutrino oscillations and set upper limits on the mixing angles and neutrino mass differences in the transitions: muon neutrino yields electron neutrino, neutrino sub tau and electron neutrino yields electron neutrino. DOE

N83-15084# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. for High Energy Physics.
THE (C TILDE S)SUB(R) CURRENT IN SIX-QUARK SCHEME
F. F. Tikhonin 1980 7 p refs Submitted for publication
(IFVE-OTF-80-29) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The (c tilde s)sub r weak hadronic current is considered in the framework of a six-quark model. In the SU(4) scheme this current arises as a second solution of equations following from the SU(2) algebra for weak charges. In analogy with the case of SU(4) a right-hand (RH) scheme of weak interaction for a six-quark model is constructed. After the necessary requirements on the parameters of RH analog of the Kobayashi-Maskava matrix are imposed, (c tilde b)sub r, (t tilde s)sub r and (t tilde b)sub r currents appear as well as neutral (s tilde b)sub r and (c tilde t)sub r currents. DOE

N83-15085# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. for High Energy Physics.
APRIORI AND UNITARY BOUNDS ON CHARACTERISTICS OF THE MULTIPLE PRODUCTION PROCESSES
V. A. Petrov 1980 10 p refs Submitted for publication
Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Some simple expressions concerning the behavior of cross sections of multiple production processes at high energies are given. With the help of the apriori estimates and unitarity restrictions are obtained on inclusive cross sections and moments of an arbitrary order of associated multiplicity distributions. It is concluded that apriori restrictions permit essential extension of the information containing both in rigorous and model results on multiple production processes. DOE

N83-15086# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. for High Energy Physics.
FAST PION PRODUCTION IN EXCLUSIVE NEUTRINO PROCESSES
S. S. Gershtein, Yu. Ya. Komachenko, and M. Yu. Khlopov 1980 37 p refs Submitted for publication
(IFVE-OTF-80-63) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Single pion production in exclusive neutrino reactions with small momentum transfer to nucleon, induced by neutrino scattering on virtual mesons (reggeons), is considered. The estimation of the contributions to process upsilon A mu pi A where A is a nucleon or the target nucleus made by various virtual mesons is presented. In the experimental investigation of such processes the contributions of different mesons may be singled out, thus providing information on the weak; meson-pion (reggeon-pion) transitions. DOE

N83-15087# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. for High Energy Physics.
CHARMED PARTICLE HADRONIC PRODUCTION
V. G. Kartvelishvili, A. K. Likhoded, and S. R. Slabospitskij 1980 23 p refs Submitted for publication
(IVFE-0TF-80-76) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

M sub (anti Q)-meson production in hadron-hadron collisions resulting from anti Q quark recombination with valence quark q sub (V) from incident hadron was considered. The cross section for M sub (anti Q) meson production is obtained. Proceeding from the short-range interaction in the rapidity space a method is proposed to calculate inclusive differential spectra of Delta sub (Q) baryons using the known M sub (anti Q) meson spectra. DOE

N83-15088# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.
A STUDY OF THE SEMILEPTONIC DECAYS OF NEUTRAL KAONS
V. K. Birulev, V. P. Dzhordzhadze, V. I. Genchev, T. S. Grigalashvili, B. N. Guskov, I. M. Ivanchenko, V. D. Kekelidze, V. G. Krivokhizhin, V. V. Kukhtin, and M. F. Likhachev 1980 25 p refs Submitted for publication
(JINR-E-1-80-542) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Dalitz plots of 74,000 K sub (electron 3) and 150,000 K sub (muon 3) decays were investigated to measure t-dependence of the form factors fsub(+)(t) and f(t) describing the vector contribu-

tion to the decay matrix element. The decays were detected by a wire spark chamber spectrometer in the Serpukhov accelerator neutral beam. An analysis of linear explansion of the form factors gives the next slopes: lambdasub(+)sup(electron) = 0.0306 + or - 0.0034 in the K sub (electron 3) decays and lambdasub(+)sup (muon) = 0.0427 + or - 0.0044, lambda = 0.0341 + or - 0.0067 in the K sub(muon 3) decays. The ratio of the form factors fsub(-) to fsub(+) was found to be fsub(-)(0)/fsub(+)(0) = 0.10 + or 0.09. These results are compared with the relevant theoretical models. Together with the data of other experiments in which the parameters of muon and electron interactions are measured, the observed difference between lambdasub(+)sup(muon) and lambdasub(+)sup(electron) gives some indication of the violation of muon-electron universality. DOE

N83-15089# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
TENSOR POLARIZATION OF THE FORWARD DEUTERONS IN THE (p, pd) AND (p, PI d) REACTIONS
B. Z. Kopeliovich, L. I. Lapidus, and L. Vegh 1980 12 p refs In RUSSIAN Submitted for publication
(JINR-E-2-80-565) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The quadrupole polarization of deuterons in the pd back scattering and in the pp- yields d pi(+) reaction at theta sub(C.M.) = 180 deg is investigated within the triangle model of Craigie and Wilkin. There is a good agreement with the experimental data for the pd scattering. The smallness of tensor polarization of forward deuterons in the A(p, xd)B reactions is predicted. DOE

N83-15090# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
ANOMALOUS DIMENSION QUARK COUNTING AT LARGE TRANSFERRED MOMENTS IN QCD
V. A. Matveev, L. A. Slepchenko, and A. N. Tavkhelidze 1980 7 p refs Submitted for publication
(JINR-E-2-80-638) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A formula is given determining the logarithmic corrections to the point-like power asymptotics of large transferred momenta processes in terms of anomalous dimensions of the quark and gluon distributions. It connects the indexes of the corresponding anomalous dimensions with the number of active and passive constituents of the hadrons participating in the reaction. DOE

N83-15091# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
PARITY-VIOLATION EFFECTS IN NUCLEON-ANTINUCLEON INTERACTIONS AT LOW ENERGIES
V. M. Dubovik, L. A. Tosunyan, and S. V. Zenkin 1980 14 p refs Submitted for publication
(JINR-E-2-80-671) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Specific features are considered for effects of the parity violation in N anti N systems. A parity violating N anti N potential is constructed and the circular polarization P sub (gamma) is estimated for gamma quanta emitted by the system. The obtained values of P sub (gamma) exceed considerably the calculated P sub (gamma) in np yields d gamma. It is shown that P sub (gamma) in the N anti N systems may be completely determined by the toroidal dipole. DOE

N83-15092# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
DERIVATION OF THE PARITY-VIOLATING INTERNUCLEON POTENTIAL
S. V. Zenkin 1980 8 p refs
(JINR-E-2-80-282) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The parity-violating internucleon potential arising from the vector-meson exchange is considered in the framework of current algebras. An approach free of uncertainties caused by the Schwinger and seagull terms is proposed for the calculation of the effective P-odd NNV vertices. The final result coincides with that of the factorization approximation and may be regarded as a substantiation of the latter. DOE

N83-15093# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. for Theoretical Physics.
MAJORANA AND DIRAC MASSES, NEUTRINO OSCILLATIONS AND THE NUMBER OF CHARGED LEPTONS
S. M. Bilenky and B. Pontecorvo 1980 7 p refs Submitted for publication
(JINR-E-2-80-399) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A scheme of lepton mixing is proposed in which the number of the charged leptons, as well as the number of neutrino types must be even. The Dirac and the Majorana masses coexist and a 'hierarchy' of different oscillation types is quite natural (for example electron neutrino reversible muon neutrino oscillations might be suppressed with respect to electron neutrino reversible vsub(tau) oscillations). The scheme requires at least one more charged lepton and one more neutrino in addition to the well known electron, muon tau electron neutrino, muon neutrino and neutrino sub(tau) leptons. In the Lagrangian the Dirac and Majorana mass terms are present on equal footing. The existence of one pair of quarks in addition to the well known u, d, s, c and b(t) quarks is required too. DOE

N83-15094# Brookhaven National Lab., Upton, N. Y.
LEPTONS FROM PP INTERACTIONS
F. E. Paige 1981 28 p refs Presented at the Phys. Opportunities at ISABELLE Summer Workshop, Upton, N.Y., 20 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE82-001809; BNL-30154; CONF-810759-5) Avail: NTIS HC A03/MF A01

Leptonic signatures for W mesons and heavy quark production at ISABELLE are discussed. DOE

N83-15095# Oak Ridge National Lab., Tenn.
ASSESSMENT OF RADIATION DOSES FROM RESIDENTIAL SMOKE DETECTORS THAT CONTAIN AMERICIUM-241
F. R. ODonnell, E. L. Etnier, G. A. Holton, and C. C. Travis Oct. 1981 69 p refs
(Contract W-7405-eng-26)
(DE82-002515; ORNL-5807) Avail: NTIS HC A04/MF A01

External dose equivalents and internal dose commitments were estimated for individuals and populations from annual distribution, use, and disposal of 10 million ionization chamber smoke detectors that contain 110 kBq americium-241 each. Under exposure scenarios developed for normal distribution, use, and disposal using the best available information, annual external dose equivalents to average individuals were estimated to range from 4 fSv to 20 nSv for total body and from 7 fSv to 40 nSv for bone. Internal dose commitments to individuals under post disposal scenarios were estimated to range from 0.006 to 80 micro-Sv (0.0006 to 8 mrem) to total body and from 0.06 to 800 micro-Sv to bone. The total collective dose (the sum of external dose equivalents and 50-year internal dose commitments) for all individuals involved with distribution, use, or disposal of 10 million smoke detectors was estimated to be about 0.38 person-Sv (38 person-rem) to total body and 00 ft squared. DOE

N83-15096# Oslo Univ. (Norway). Experimental High Energy Physics Group.
A FAST FILTER PROCESSOR AS A PART OF THE TRIGGER LOGIC IN AN ELASTIC SCATTERING EXPERIMENT
Ivar Kenyon Gjerpe [1980] 27 p refs
(OUP-80-20) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A fast special purpose processor as a part of the trigger logic in an elastic scattering experiment is described. The decision to incorporate such a processor was taken because the trigger rate was estimated to be an order of magnitude higher than the data taking capability of the on-line minicomputer, a NORD 10. The processor is capable of checking the coplanarity and the opening

angle of the two outgoing tracks within about 100 microsec. This is done with a spatial resolution of 1 mm by using two points along each track given by three MWPC's. For comparison this is two orders of magnitude faster than the same algorithm coded in assembler language on a PDP11/40. The main contribution to this increased speed is due to extensive use pipelining and parallelism. When running with the processor in the trigger, 75% more elastic events per incoming beam particle were collected, and three times as many elastic events per trigger were recorded on to tape for further in-depth analysis than previously. Due to major improvements in the primary trigger logic, this was less than the gain initially anticipated. DOE

N83-15097# European Organization for Nuclear Research, Geneva (Switzerland).
LOW-P/SUB T/ PHYSICS
P. L. Braccini, L.-L. Chau, G. Giacomelli (Bologna Univ.), T. F. Kycia, S. J. Lindenbaum (Pisa Univ.), R. S. Longacre, and M. Valdata-Nappi 1981 17 p refs Presented at the Phys. Opportunities at ISABELLE Summer Workshop, Upton, N.Y., 20 Jul. 1981 Prepared in cooperation with Brookhaven National Lab.
(Contract DE-AC02-76CH-00016)
(DE82-002247; BNL-30185; CONF-810759-8) Avail: NTIS HC A02/MF A01

The processes were examined with large cross sections, namely total cross sections, elastic scattering, particle production at low p/sub t/ and diffraction excitation. The main features of these large cross section processes are studied experimentally using relatively simple set ups at an early stage of phase I Isabelle operation. Higher luminosities are needed to study elastic scattering at larger angles, particles production at medium values of p/sub t/ and the production of new flavor. The large cross section processes are characterized by features which change slowly, logarithmically with c.m. energy. The new large range of energies will allow a detailed study of the energy dependences of the processes. Detailed comparisons with similar experiments in anti pp collisions is also possible. GRA

N83-15098# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Ehnergij.
NEUTRAL MESONS WITH HEAVY QUARKS AND MIXING ANGLES IN SIX-QUARKS MODEL
A. G. Liparteliani, V. A. Monich, Yu. P. Nikitin, and G. G. Volkov 1980 11 p refs
(IFVE-OTF-80-25) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The expressions for transition amplitudes for K(0)-like systems into their antisystems in the framework of a six-quark model were obtained. The mass differences of longlived and shortlived states of neutral mesons are calculated for finite magnitudes of momenta of external fermion lines of box diagrams. DOE

N83-15099# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Ehnergij.
PRODUCTION OF CHARGED HADRONS WITH LARGE TRANSVERSE MOMENTS IN PP COLLISIONS AT 70 GeV
V. V. Abramov, A. V. Alekseev, B. Yu. Baldin, S. I. Bityukov, V. Yu. Glebov, A. S. Dyshkant, V. N. Evdokimov, A. N. Krinitsyn, V. I. Kryshkin, N. Yu. Kulman et al 1980 11 p refs
(IFVE-OEF-80-80; SERP-E-100) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Results are presented on the invariant cross sections of pion(+-), K(+-), p and anti p production and particle yield ratios in the 1.0 to 3.9 GeV/c range of transverse momenta at 90 deg in the c.m.s. in pp collisions at 70 GeV. The data are compared with the results obtained at higher energies and with QCD predictions. Energy dependence of the cross sections and ratios as well as their dependence on the Feynman variable are qualitatively well described by the QCD model. Particle ratios are in better agreement with QCD predictions than the cross sections. DOE

N83-15100# Los Alamos Scientific Lab., N. Mex.
ELECTRONICS FOR THE LAMPF NEUTRINO EXPERIMENT'S VETO COUNTER SYSTEM
Charli Dalton Sep. 1981 10 p
(Contract W-7405-eng-36)
(DE82-002601; LA-8911-MS) Avail: NTIS HC A02/MF A01

A cosmic ray veto detector was constructed in the neutrino cave. The electronic readout system designed to buffer and compact the data from the detector is described. GRA

N83-15101# Sandia Labs., Albuquerque, N. Mex.
PARTICLE SIMULATION OF RADLAC
J. W. Poukey, S. L. Shope, and R. B. Miller 1981 5 p refs Presented at the 1981 Linear Accelerator Conf., Santa Fe, N. Mex., 19 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-001911; SAND-81-1434C; CONF-811083-1) Avail: NTIS HC A02/MF A01

A crucial problem in high-current radial line electron accelerators is radial oscillations of the beam in the foilless diode injector and in the accelerating gaps. This problem is studied via 2-1/2-D particle simulations (quasistatic and electromagnetic) in cylindrical r,z geometry, with emphasis on contouring the applied magnetic field for optimum transport. The results are generally optimistic for future systems; however, further work is needed on designing the injector. DOE

N83-15102# Netherlands Energy Research Foundation, Petten.
A PROGRAM FOR THE CONVERSION OF FINE GROUP FLUX DENSITY AND CROSS SECTION DATA TO COARSE GROUP VALUES
H. C. Rieffe Apr. 1981 21 p refs
Avail: NTIS (US Sales Only) HC A01/MF A01; DOE Depository Libraries

The computer program FITOCO is described which converts neutron spectrum data and group cross section data from a fine group structure into a coarser group structure. This type of conversion has to be used often in neutron activation spectrometry when unfolding procedures are applied. The program requires as input a representation of the weighing spectrum and a neutron cross section library, both in the fine group structure of the SAND-II type. The output group structure is determined by the input cards of the program. The program can calculate also the effective coarse group cross section values for a cross section of a material inside a detector cover (i.e., B-10 or Cd). DOE

N83-15103# Sandia Labs., Albuquerque, N. Mex.
SATURATION, EXCHANGE AND RETENTION OF IMPLANTED D/H IONS IN FUSED SILICA
B. L. Doyle and G. W. Arnold 1981 8 p refs Presented at the Ann. Meeting of the Mater. Res. Soc., Boston, 16 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003494; SAND-81-2485C; CONF-811122-22) Avail: NTIS HC A02/MF A01

Elastic recoil detection techniques were used to measure hydrogen isotope profiles in fused silica implanted with 20 keV H and/or D ions. The H and D exchanges are observed for saturated samples subsequently implanted with a different H-isotope. A previously developed local mixing model of H-trapping was extended to include retrapping and beam induced detrapping for application to these studies. This theoretical analysis provides a good fit to the H/D saturation and isotope exchange behavior. Isochronal annealing shows that both H and D are released in a single stage centered about 550 deg C. GRA

N83-15104# California Univ., Berkeley. Lawrence Berkeley Lab.
LAWRENCE BERKELEY LABORATORY NEUTRAL-BEAM ENGINEERING TEST FACILITY POWER-SUPPLY SYSTEM
I. C. Lutz, C. A. Arthur, G. J. deVries, and H. M. Owren Oct. 1981 5 p refs Presented at the 9th Symp. on Engr. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003044; LBL-12722; CONF-811040-86) Avail: NTIS

HC A02/MF A01

The Lawrence Berkeley Laboratory is upgrading the neutral beam source test facility into a neutral beam engineering test facility (NBETF) with increased capabilities for the development of neutral beam systems. The NBETF will have an accel power supply capable of 170 kV, 70 A, 30 sec pulse length, 10% duty cycle; and the auxiliary power supplies required for the sources. The major components, their ratings and capabilities, and the flexibility designed to accommodate the needs of source development are described. DOE

N83-15105# California Univ., Berkeley. Lawrence Berkeley Lab.
STEADY STATE GAS EFFICIENCY OF ION SOURCES FOR NEUTRAL BEAMS
M. C. Vella, K. H. Berkner, D. J. Masoletti, H. M. Owren, and J. E. Willis Sep. 1981 6 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 2-6 Nov. 1981
(Contract W-7405-eng-48)
(DE82-003330; LBL-13311; CONF-811113-36) Avail: NTIS HC A02/MF A01

Gas present in the acceleration grids of a neutral beam line is one cause of divergent beam power. A measure of this problem is the gas efficiency (nuclear) of the ion source, epsilon/sub g/ = I/sub b// I/sub g/, where I/sub b/ denotes the extracted current of beam nuclei, and I/sub g/ the total current of nuclei to the source as gas. For a short pulse beam, less than = 0.1 sec, gas transients make epsilon/sub g/ difficult to observe. Using the fraction size Berkeley LPA (nominally 120 keV, 10A), the gas efficiency of a positive in, hydrogen neutral bea has been studied with pulses from 0.5 to 28 sec at 80 keV, 5.7 A, and 0.5 sec at 120 keV, 10A. The observed gas efficiency, 20% to 40%, is shown to agree with a simple steady state model. The model indicates that gas efficiency is determined by the degree of arc ionization. DOE

N83-15106# Copenhagen Univ. (Denmark).
ENERGY LOSS SPECTRA IN PLANAR CHANNELING
S. Steenstrup and A. P. Pathak 1980 24 p refs
(KU-HCOE-FL2-R-80-07) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Using simple models for the motion of particles in planar channels and for the energy loss and its dependence on the path, energy loss spectra of particles transmitted through thin foils in planar channels are calculated. A comparison with measurements is made. DOE

N83-15107# Copenhagen Univ. (Denmark). Physics Lab. 2.
INVESTIGATION OF THE REFLECTION OF LOW ENERGY ELECTRONS FROM THE SURFACES OF LAYERED TRANSITION METAL DICHALCOGENIDES
A. E. Smith, M. H. Mohamed (Somali National Univ.), T. Wohlenberg, E. Johnson, L. T. Chadderton, and P. J. Moeller 1980 11 p refs
(KU-HCOE-FL2-R-80-09; ISSN-0106-7222) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Experimental measurements, using the total current spectroscopy (TCS) technique, on the energy dependence of the reflection of low energy electrons from clean surfaces of layered transition metal dichalcogenides are reported for the molybdenum semiconductor compounds 2H-MoS2 and 2H-MoSe2. A simple model calculation involving both elastic and inelastic scattering is presented and correspondence established with the experimental spectra. In this picture information on the electronic band structure of the materials can then be extracted from the single particle component of the inelastic scattering. The model is extended to show that a feature in the 2H-MoS2 experimental spectrum may be attributed to the excitation of an intermediate plasmon. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N83-15108# Sandia Labs., Albuquerque, N. Mex.
ION-IMPLANTATION STUDIES OF NUCLEAR-WASTE FORMS
C. J. M. Northrup, Jr., G. W. Arnold, and T. J. Headley 1981 24 p refs Presented at Ann. Meeting of the Mater. Res. Soc., Boston, 16 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-003344; SAND-81-1373C; CONF-811122-18) Avail: NTIS HC A02/MF A01

The first observations of physical and chemical changes induced by lead implantation damage and leaching are reported for two proposed US nuclear waste forms for commercial wastes. To simulate the effects of recoil nuclei due to alpha decay, the materials were implanted with lead ions at equivalent doses. In the titanate waste form, the zirconolite, perovskite, hollandite, and rutile phases all exhibited a mottled appearance in the transmission electron microscopy (TEM) typical of defect clusters in radiation damaged, crystalline solids. One titanate phase containing uranium was found by TEM to be amorphous after implantation at the highest dose. No enhanced leaching (deionized water, room temperature, 24 hours) of the irradiated titanate waste form, including the amorphous phase, was detected by TEM, but Rutherford backscattering (RBS) suggested a loss of cesium and calcium after 21 hours of leaching. DOE

N83-15109# International Atomic Energy Agency, Vienna (Austria).
EVALUATION OF SOLIDIFIED HIGH-LEVEL WASTE FORMS
1981 62 p refs Presented at the IAEA Evaluation of Solidified High Level Radioactive Waste Products Workshop, Berlin, West Germany, 15-19 Oct. 1979
(IAEA-TECDOC-239; CONF-7910184-Summ) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The key information disseminated at the second meeting of a program to review information on the properties and production of solidified waste forms is summarized. DOE

N83-15110# Illinois Univ., Urbana. Fusion Studies Lab.
ADVANCED FUEL CONCEPTS AND APPLICATIONS
G. H. Miley 1981 13 p refs Presented at Meeting and Workshop on Fusion Reactor Design and Technol., Tokyo, 5 Oct. 1981
(Contract DE-AS02-76ET-52040)
(DE82-002710; COO-2218-230; CONF-811046-10) Avail: NTIS HC A02/MF A01

Advanced fuel (AF) fusion cycles when potentially offer improved environmental compatibility and lower costs are discussed. This comes about by elimination of tritium breeding requirements and by a reduction in neutron flux. Also a larger energy fraction carried by charged particles makes direct energy conversion more suitable. As a first application, a symbiotic system of semicatalyzed deuterium fueled hybrid fuel factories, supplying both fissle fuel to light water reactors and 3He to D-3He satellite fusion reactors, is proposed. Subsequently, an evolution into a system of synfuel factories with satellite D-3He reactors is envisioned. GRA

N83-15111# California Univ., Livermore. Lawrence Livermore Lab.
ASSESSMENT OF SOME OF THE PROBLEMS IN THE USA OF SUPERCONDUCTING MAGNETS FOR FUSION RESEARCH
D. N. Cornish 5 Nov. 1981 3 p Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003066; UCRL-86877; CONF-811040-105) Avail: NTIS HC A02/MF A01

Problems encountered during the development of superconductors and superconducting magnets for fusion are discussed. Under

estimation and development and fabrication of superconductors are considered. DOE

N83-15112# California Univ., Livermore. Lawrence Livermore Lab.
RESISTANCE-DRIVEN BUNCHING MODE OF AN ACCELERATED ION PULSE
Edward P. Lee 16 Oct. 1981 4 p refs Presented at the 1981 Linear Accelerator Conf., Santa Fe, N. Mex., 19-23 Oct. 1981
(Contract W-7405-eng-48)
(DE82-002061; UCRL-86452; CONF-811083-2) Avail: NTIS HC A02/MF A01

Amplification of a longitudinal perturbation of an ion pulse in a linear induction accelerator is calculated. The simplified accelerator model consists only of an applied field (E/sub a/), distributed gap impedance per meter (R) and beam-pipe capacity per meter (C). The beam is treated as a cold, one-dimensional fluid. It is found that normal mode frequencies are nearly real, with only a very small damping rate proportional to R. This result is valid for a general current profile and is not restricted to small R. However, the mode structure exhibits spatial amplification from pulse head to tail by the factor exp(RCLv/sub o//2), where L is pulse length and Vo is drift velocity. This factor is very large for typical HIF parameters. An initially small disturbance, when expanded in terms of the normal modes, is found to oscillate with maximum amplitude proportional to the amplification factor. DOE

N83-15113# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
VITRIFICATION OF HIGH-LEVEL RADIOACTIVE WASTE IN A SMALL-SCALE JOULE-HEATED CERAMIC MELTER
M. J. Plodinec and G. B. Woolsey 1981 11 p refs Presented at the Ann. Meeting of the Mater. Res. Soc., Boston, 16 Nov. 1981
(Contract DE-AC09-76SR-00001)
(DE82-002227; DP-MS-81-54; CONF-811122-6) Avail: NTIS HC A02/MF A01

Direct feeding of actual liquid-waste slurries to the small melter is discussed. The liquid-feeding tests demonstrated that addition of premelted glass frit to the waste slurry reduces the amount of material volatilized. Results of these tests are in accord with results of large-scale tests with actual waste. DOE

N83-15114# International Atomic Energy Agency, Vienna (Austria).
PACKAGING OF RADIOACTIVE WASTES FOR SEA DISPOSAL
1981 43 p refs Presented at a Tech. Comm. Meeting on Containers and Packaging for Ocean Dumping, Vienna, 3-7 Dec. 1979
(IAEA-TECDOC-240; CONF-791266) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The Convention on the Prevention of Marine Pollution by the Dumping of Wastes and Other Matter, known as the London Dumping Convention was adopted by an inter-governmental conference in London in 1972 and came into force in 1975. In 1977, the IAEA Board of Governors agreed that there is a continuing responsibility for the IAEA to contribute to the effectiveness of the London Dumping Conventions by providing guidance relevant to the various aspects of dumping radioactive wastes at sea. In the light of the above responsibilities, the IAEA organized a Technical Committee Meeting from 3 to 7 December 1979 to assess the current situation concerning the requirements and the practices of packaging radioactive wastes for dumping at sea with a view to providing further guidance on this subject. The results of this meeting are summarized. DOE

N83-15115# Commission of the European Communities, Brussels (Belgium). Directorate General for Research, Science and Education.
RISKS, REGULATION RESPONSIBILITIES AND COSTS IN NUCLEAR WASTE MANAGEMENT: A PRELIMINARY SURVEY IN THE EUROPEAN COMMUNITY
S. Orlowski 1980 41 p refs
(EUR-6893) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The use of nuclear energy produces radioactive waste which may present risks of pollution for man and his environment. Their protection must be ensured by technical or institutional controls. The report examines the second, i.e., the administrative, legal and financial measures, dealing with the management of radioactive waste in existence or under consideration within the Member States of the European Community. The following aspects are studied: laws and regulations, authorities concerned, costs and financing of radioactive waste management, civil liability, national policies, international aspects of radioactive waste management. DOE

N83-15116# Sandia Labs., Albuquerque, N. Mex.
PULSED POWER FOR INERTIAL-CONFINEMENT FUSION
T. H. Martin, J. P. VanDevender, D. L. Johnson, E. L. Neau, W. B. Boyer, J. T. Crow, and B. N. Turman 1981 4 p refs Presented at the 9th Symp. on Engr. Problems of Fusion Res., Chicago, 26 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-001991; SAND-81-2446C; CONF-811040-35) Avail: NTIS HC A02/MF A01

Pulsed power development for inertial confinement fusion continues at a rapid rate. The scalability of these types of pulse power systems has been successfully demonstrated during the past few years through a continuum of fully modular, pulsed power accelerators at Sandia which include Proto I at 1 TW, Proto II at 11 TW,PBFA-I at 30 TW, and the projected PBFA-II at 100 TW. Several problems which have limited previous technology to a few tens of terawatts have been solved or appear to have solutions. Several of these solutions are being incorporated into the PBFA-II baseline design which will be introduced. DOE

N83-15117# California Univ., Livermore. Lawrence Livermore Lab.
HEAVY-ION INERTIAL FUSION: INITIAL SURVEY OF TARGET GAIN VERSUS ION-BEAM PARAMETERS
R. O. Bangerter, J. W. K. Mark, and A. R. Thiessen 26 Oct. 1981 12 p refs Presented at the 22nd Ann. Meeting of the Div. of Plasma Phys. of the APS, San Diego, Calif. 10-14 Nov. 1980
(Contract W-7405-eng-48)
(DE82-003069; UCRL-84821-Rev-1; CONF-801119-5-Rev-1) Avail: NTIS HC A02/MF A01

Inertial-fusion targets have been designed for use with heavy-ion accelerators as drivers in fusion energy power plants. We have made an initial survey of target gain versus beam energy, power, focal radius, and ion range. This provides input for understanding the trade-offs among accelerator designs. DOE

N83-15118# Sandia Labs., Albuquerque, N. Mex.
PARTICLE-BEAM FUSION Progress Report, Jul. - Dec. 1980
Oct. 1981 141 p refs
(Contract DE-AC04-76DP-00789)
(DE82-003107; SAND-81-0683) Avail: NTIS HC A07/MF A01

Progress in research of particle beam fusion is reported. The following topics are discussed: (1) fusion target studies, (2) target experiments, (3) particle beam souce theory, (4) diagnostics development, (5) particle beam experiments, (6) pulsed power research, and (7) pulsed power applications. GRA

74 OPTICS

Includes light phenomena.

N83-15119# Adaptive Optics Associates, Inc., Cambridge, Mass.
ADVANCED IMAGING TRACKER Final Technical Report, 10 Jun. 1980 - 31 Dec. 1981
Larry E. Schmutz Griffiss AFB, N.Y. RADC Jun. 1982 186 p refs
(Contract F30602-80-C-0216; ARPA Order 3503; AF Proj. C503)
(AD-A119045; RADC-TR-82-161) Avail: NTIS HC A09/MF A01 CSCL 17/5

A new imaging-tracker device capable of tracking a distant

optical or infrared target at response rates of 8 KHz, and imaging that target at frame rates of 30 Hz to 8x8 pixel resolution has been developed and demonstrated in computer simulation and in hardware implementation. The system uses a simple quad cell detector for both tracking and imaging, employing an advanced scanner system and reconstruction technique to perform imaging. Image reconstruction and centroid tracking algorithms have been defined and characterized analytically and numerically in terms of accuracy and signal-to-noise performance. A dedicated high-speed digital processor system was developed and used to implement the imaging and tracking algorithms in conjunction with a specially designed optical breadboard of the imager-tracker system. Author (GRA)

N83-15120# Materials Research Labs., Ascot Vale (Australia). Organic Chemistry Div.

A LOW COST, SIMPLE, PORTABLE INSTRUMENT FOR THE MEASUREMENT OF INFRA-RED REFLECTANCE OF PAINTS

F. Marson May 1982 26 p refs

(AD-A118912; MRL-R-857; AR-003-038) Avail: NTIS HC A03/MF A01 CSCL 14/2

The construction and design of a low cost, simple, portable infra-red reflectometer which can be used to estimate the reflectance of paint films in the 800 nm region is described. The infra-red reflectances of a range of lustreless, semigloss and gloss olive drab camouflage paints determined using this instrument are compared to those obtained using modified commercial equipment and to the reflectances measured at 800 nm using a Cary model 17 spectrophotometer. The new reflectometer was shown to be superior to the modified commercial instrument currently specified in Australian government paint specifications and to be capable of estimating the reflectance of olive drab paints to within about one per cent of the Cary derived reflectance values. The reflectance values for a range of 24 experimental coatings made with pigments of varying absorption in the infra-red region are used to illustrate the effect of the instrument's spectral response and the necessity of establishing a reliable working standard. Author (GRA)

N83-15121# Naval Ocean Systems Center, San Diego, Calif.

HIGH-PRESSURE VIEWPORTS FOR INFRARED SYSTEMS. PHASE 2: CHALCOGENIDE GLASS Final Report, Oct. 1980 - Sep. 1981

J. D. Stachiw and S. I. Bertics 28 Jan. 1982 123 p refs

(AD-A119495; NOSC/TR-634) Avail: NTIS HC A06/MF A01 CSCL 17/5

An experimental study established the effectiveness of chalcogenide glass composition AMTIR-1 (Ge33As12Se55) as structural material and/or coating material or windows in IR systems operating in a marine environment. Test results show that the optical and structural properties of the material are not degraded by continuous or intermittent submersion in seawater. A tremendous potential reduction in expenditures would result from its application wherever feasible. Author (GRA)

N83-15122# Naval Underwater Systems Center, New London, Conn.

PREDICTION OF OPTICAL IMAGE QUALITY NEAR THE SEA SURFACE FROM METEOROLOGICAL MEASUREMENTS

Frank S. Replogle, Jr. 13 Jul. 1982 46 p refs

(AD-A119575; NUSC-TR-6713) Avail: NTIS HC A03/MF A01 CSCL 20/6

A mechanism to calculate the optical index structure constant C2N from bulk meteorological measurements made over the ocean is presented. From this, and a formulation of the near field optical propagation from an incoherent point source, the expected line spread function for near-the-sea-surface lines of sight are calculated. Three series of photographic line width observations are compared with calculated line widths. Mean values of observed results agree with the calculations within about 25% for conditions of strong atmospheric instability. It is concluded that the formulations derived are accurate to at least + or - 25% for conditions of strong atmospheric instability. Observations made under conditions of neutral and stable atmospheric buoyancy were instrumentally limited to an angular subtense of 2 to 4 arc sec. These measured line width values fall between 1.9 and 0.6 times the values computed from meteorological measurements. The variability of image spreading observed across the target fields is indicative of the difficulty of employing a single mechanism to correct for atmospherically induced image smear. GRA

N83-15123# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.

OPERATING CHARACTERISTICS OF HSURIA ANNULAR RESONATOR WITH A W-AXICON AND A REAR FLAT CAVITY MIRROR

Eugene B. Turner, Richard A. Chodzko, and Stephen B. Mason 12 Jul. 1982 55 p refs

(Contract F04701-81-C-0082)

(AD-A119540; TR-0082(2930-01)-6; SD-TR-82-48) Avail: NTIS HC A04/MF A01 CSCL 20/5

In this report are presented the results of tests performed on the half-symmetric unstable resonator with an internal axicon (HSURIA) using a large diameter, closed-cycle CO2 laser facility. The HSURIA used for these tests consisted of a linear W-axicon, a convex spherical feedback mirror and a flat rear cavity mirror. This resonator produced a linearly polarized I = 0 mode of good beam quality. Tests were designed to investigate several critical issues related to the use of the HSURIA with a cylindrical chemical laser, namely, the misalignment sensitivity of the elements, optical effects of support struts, and the feasibility of reducing the high flux on the W-axicon tip by obscuration of the tip. Tests were performed for a variety of resonator configurations with different parameters. The beam quality was rapidly degraded by small angular misalignments of the rear flat but was scarcely affected by much larger misalignments of the feedback mirror. The insertion of strut masks resulted in an unexpectedly large power loss. Analysis indicates that these losses are caused by diffraction effects combined with partial saturation of the medium. A small effective obscuration of the W-axicon tip had little effect on the mode or beam quality, but obscuration diameters with a Fresnel number approaching unity (referred to as the compacted leg length) caused a loss of mode control and a large degradation in beam quality. GRA

N83-15124# California Univ., Livermore. Lawrence Livermore Lab.

SHORT COURSE IN OPTICAL-FABRICATION TECHNOLOGY

N. J. Brown 26 Oct. 1981 28 p Presented at the Ann. Meeting of the Opt. Soc. of Am., Orlando, Fla., 26-30 Oct. 1981

(Contract W-7405-eng-48)

(DE82-001624; UCRL-86796; CONF-811067-1) Avail: NTIS HC A03/MF A01

Topics discussed include optical shapes, the wear equation, the grinding and polishing of glass, the polishing of metals, the mechanics of polishing machines, the figuring and polishing of platelike and tubular optics, and simple shop calculations. Emphasis is on numerical methods. DOE

N83-15125# Pacific Northwest Lab., Richland, Wash.

DEVELOPMENT OF DAMAGE-RESISTANT SPUTTERED-OXIDE OPTICAL COATINGS FOR USE AT 248 NM

W. T. Pawlewicz, P. M. Martin, D. D. Hays, and I. B. Mann Oct. 1981 68 p refs

(Contract DE-AC06-76RL-01830)

(DE82-003525; PNL-3869) Avail: NTIS HC A04/MF A01

The results of a six-month effort to develop damage-resistant Kr*F laser mirrors by using and refining reactive sputter deposition techniques for the fabrication of multilayer oxide optical coatings. Mirror performance goals included a reflectivity of 99% at 248 nm and a laser damage threshold of 5 J/sq cm for 20 ns pulses. Oxide multilayer coating combinations selected for development were SiO2/Al2O3, SiO2/HfO2 and SiO2/Y2O3. Selection was based on review and compilation of the optical properties of oxide materials reported in the recent literature. Twenty-eight coatings of selected designs were fabricated on substrates for laser damage testing. Forty other coatings were fabricated for optical, microstruc-

tural, and topographical characterization aimed at optimization of their performance. Specimens for damage testing consisted of single layers of Al2O3, HfO2 and Y2O3 in thicknesses of lambda/2, 3 lambda/2 and 2 lambda at 248 nm. DOE

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N83-15126# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROCEEDINGS OF INTERNATIONAL TOPICAL MEETING ON ICF RESEARCH BY LIGHT-ION BEAM
Kiyoshi Yatsui, ed. Oct. 1982 163 p refs Meeting held at Nagaoka, Japan, 11-12 May 1982 Sponsored in part by the Ministry of Education, Science and Culture of Japan
(IPPJ-611) Avail: NTIS HC A08/MF A01

High-brightness proton beams (.4 MA, 1 MV) have recently been extracted from 20 sq cm axial pinch-reflex diodes (PRDs) mounted on the NRL Gamble II generator. A source power brightness > 10 TW/sq cm RAD(2) was achieved in these experiments. A new barrel-shaped equitorial PRD that can be coupled to PBFA-II has also been operated on Gamble II and has demonstrated 50% proton efficiency with predominantly azimuthally-symmetric charged-particle flow. In other experiments the stopping of power deuterons in hot plasmas was measured using a PRD on Gamble II. Results show about 40% enhancement in stopping power over that in cold targets when the beam was focused to about .25 MA/sq cm. Research is also being performed on transporting ion beams in large-diameter channels (> 2.5 cm) and on a post-transport, plasma-filled, magnetic-focusing section to bring the beam to pellet dimensions. Author

N83-15127*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIELECTRIC AND PERMEABILITY
Keith D. Cole (La Trobe Univ., Bundoora, Australia) Jul. 1982 35 p refs Submitted for publication
(NASA-TM-84948; NAS 1.15:84948) Avail: NTIS HC A03/MF A01 CSCL 20I

Using the unabridged Maxwell equations (including vectors D, E and H) new effects in collisionless plasmas are uncovered. In a steady state, it is found that spatially varying energy density of the electric field (E perpendicular) orthogonal to B produces electric current leading, under certain conditions, to the relationship P perpendicular + B(2)/8 pi-epsilon E perpendicular(2)/8 pi = constant, where epsilon is the dielectric constant of the plasma for fields orthogonal to B. In steady state quasi-two-dimensional flows in plasmas, a general relationship between the components of electric field parallel and perpendicular to B is found. These effects are significant in goephysical and astrophysical plasmas. The general conditions for a steady state in collisionless plasma are deduced. With time variations in a plasma, slow compared to ion-gyroperiod, there is a general current, (j*), which includes the well-known polarisation current, given by J* = [d/dt (ExM) + (PxB)] xB B(-2) where M and P are the magnetization and polarization vectors respectively. M.G.

N83-15128*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW THEORY OF SOURCES OF BIRKELAND CURRENTS
K. D. Cole Sep. 1982 48 p refs Submitted for publication
(NASA-TM-84949; NAS 1.15:84949) Avail: NTIS HC A03/MF A01 CSCL 20I

An approach to collisionless plasma shows the existence of current orthogonal to B along the low latitude boundary layer of the magnetosphere driven by electric field which is orthogonal to both B and the layer. In this case relationship P perpendicular + (sq B/8 pi) - (sq epsilon E perpendicular/8 pi) = constant holds on a line orthogonal to B and the layer, where epsilon is the dielectric constant of the plasma for electric fields orthogonal to B. Across the geomagnetic tail there flows a current in the direction of the dawn-dusk electric field, and in this case a relationship P perpendicular + (sq B/8 pi) + (sq epsilon E perpendicular/8 pi = constant, holds aong a line orthogonal to E and B. Divergence of both these currents is shown to be a source of Birkeland currents. Some of the boundary layer current is continuous with current across the tail. Electric currents of physically similar origin flow in interplanetary space, and when the magnetosphere interrupts them, additional Birkeland currents are driven. Author

N83-15129# Indiana Univ., Bloomington. Dept. of Chemistry.
THE USE OF A MICROARC ATOMIZER FOR SAMPLE INTRODUCTION INTO AN INDUCTIVELY COUPLED PLASMA Interim Technical Report
J. P. Keilsohn, R. D. Deutsch, and G. M. Hieftje 1 Sep. 1982 27 p refs Submitted for publication Sponsored in part by NSF
(Contract N00014-76-C-0838; NR Proj. 051-622)
(AD-A119303; INDU/DC/GMH/TR-82-47; Rept-55) Avail: NTIS HC A03/MF A01 CSCL 20/9

The use of a microarc atomizer as a device for microsample introduction into the ICP(Inductively Coupled Plasma) is described. The microarc, a high-voltage, low-current, pulsating dc discharge, efficiently vaporizes desolvated, discrete microvolumes of sample solution into the plasma. The microarc-ICP combination exhibits relative detection limits and working curves comparable to those of other methods of sample introduction but functions with sample volumes in the 0.5 - 1.0 microliter range. Matrix and ionization interference effects are absent or trivially overcome. Computer control of the instrument adds simplicity of operation.
Author (GRA)

N83-15130# Indiana Univ., Bloomington. Dept. of Chemistry.
DESIGN AND CONSTRUCTION OF A LOW-FLOW, LOW-POWER TORCH FOR INDUCTIVELY COUPLED PLASMA SPECTROMETRY Interim Technical Report
R. Rezaaiyaan, G. M. Hieftje, H. Anderson, H. Kaiser, and B. Meddings 1 Sep. 1982 30 p refs Submitted for publication
(Contract N00014-76-C-0838; Grant NSF CHE-79-18073; NR Proj. 051-622)
(AD-A119302; INDU/DC/GMH/TR-82-46; Rept-54) Avail: NTIS HC A03/MF A01 CSCL 20/9

A detailed study of the importance of various spatial dimensions in an ICP(Inductively Coupled Plasma) torch is described. Of the various dimensions which were examined, the annular spacing between the coolant (outer) and plasma (flared) tube is most critical for plasma stabilization at low argon coolant flows and applied radio frequency powers. Similarly, the inner diameter of the aerosol injection tube was found to be important, with the value of 1.0 mm chosen for a compromise between low-power, low-flow capability and routine analysis of high-solids sample solutions. A construction at the inlet of the coolant argon was found not to affect plasma stability greatly, but altered significantly the applied powers and coolant flows which were necessary for plasma ignition. With these and other torch dimensions optimized, it was found to be possible to ignite a plasma at a coolant flow of 5 liters per minute and an applied radio frequency power of 450 W. Continued operation of the plasma during analysis of real samples or during aspiration of a 1% NaCl solution was found to be possible alternatively at 500 W (rf power) and 3.5 L/min. coolant argon or 125 W and 5.5 L/min., respectively. Author (GRA)

N83-15131# Science Applications, Inc., McLean, Va.
RADIATION FROM HIGH TEMPERATURE PLASMAS, PHASE 2 Final Report, 15 Jul. 1981 - 14 Jul. 1982
Christopher Agritellis Aug. 1982 35 p refs
(Contract N00014-81-C-2398)
(AD-A119468; SAI-83-883-WA) Avail: NTIS HC A03/MF A01 CSCL 20/9

A large number of atomic physics and magnetohydrodynamic computer codes have been developed by members of the NRL Plasma Radiation Branch of the Naval Research Laboratory over several years. These codes involve the simulation of complex

physical processes in a variety of plasma radiation research investigations. In this research effort, the structure of many of these codes was analyzed to improve the numerical procedures or to speed calculational time by code vectorization. In addition, graphic techniques were developed to improve the display of the results, which is important both to detect coding errors and to elucidate physical mechanisms. In this report, we describe the codes that were improved and present examples of the graphical displays now available for analysis of the calculational results.
Author (GRA)

N83-15132# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
FUSION MATERIALS: ADAPTING TO REALISTIC REACTOR ENVIRONMENTS
G. L. Kulcinski Oct. 1981 25 p refs Presented at the Meeting and Workshop on Fusion Reactor Design and Technol., Tokyo, 5-16 Oct. 1981 Sponsored in part by the Wisconsin Electric Utilities Research Foundation
(Contract DE-AS02-78ET-52048)
(DE82-002708; DOE/ET-52048/21; UWFDM-437; CONF-811046-11) Avail: NTIS HC A02/MF A01

There has been considerable movement in the fusion materials field since the last International Workshop on Reactor Design was held in Madison (1977). Some of the movement has been forward; e.g., we now have much better theoretical descriptions of the melting, vaporization, and electromechanical stresses imposed on first wall material during plasma disruptions. Some of the movement has been sideways, e.g., the Fusion Materials Irradiation Test Facility (FMIT) now has slipped 3 years in its schedule since the last conference 4 years ago. Finally, there has been very little progress in the fields of pulsed damage simulation for Inertial Confinement Fusion (ICF) Systems, definition of the radiation spectra from ICF targets, or the experimental determination of disruption characteristics for magnetic fusion devices. Several new ideas have appeared since 1977 such as the use of low swelling martensitic alloys, the use of a much more favorable breeding material, Pb83Li17, and there have been two major efforts to design materials test facilities: INTOR and TASKA. DOE

N83-15133# California Univ., Livermore. Lawrence Livermore Lab.
UTILIZING SUBCOOLED, SUPERFLUID He-II IN THE DESIGN OF A 12-TESLA TANDEM-MIRROR EXPERIMENT
R. W. Hoard, D. N. Cornish, R. W. Baldi, and W. D. Taylor 11 Nov. 1981 10 p refs Presented at the Workshop on Stability of Superconducting in He-I and He-II, Saclay, France, 16-19 Nov. 1981 Prepared in cooperation with General Dynamics, San Diego, Calif.
(Contract W-7405-eng-48)
(DE82-003322; UCRL-86326; CONF-811140-1) Avail: NTIS HC A02/MF A01

A design study of 12-T yin-yang coils for a conceptual tandem mirror next step (TMNS) facility was performed. The large magnets have major and minor radii of 3.7 and 1.5 m, 0.70 x 3.75 sq m cross section, 46.3 MA turns, and an overall current density of 1765 A/sq cm, obtained by the use of Nb3Sn and Nb-Ti superconductors. Each coil is composed of several subcoils separated by internal strengthening substructure to react the enormous electromagnetic forces. The size of the yin-yang coils, and hence the current density, was reduced by utilizing subcooled, superfluid He-II at 1.8 K for the coolant. The design study is reviewed with emphasis on He-II heat transport and conductor stability. Methods are also presented which allow the extension of Gorter-Mellink-channel calculations to encompass multiple, interconnecting coolant channels. DOE

N83-15134# California Univ., Livermore. Lawrence Livermore Lab.
DESIGNS OF TANDEM-MIRROR FUSION REACTORS
G. A. Carlson, W. L. Barr, B. M. Boghosian, R. S. Devoto, J. N. Doggett, G. W. Hamilton, B. M. Johnston, J. D. Lee, B. G. Logan, R. W. Moir et al 1 Oct. 1981 21 p refs Presented at the Meeting and Workshop on Fusion Reactor Design and Technol., Tokyo, 5-16 Oct. 1981
(Contract W-7405-eng-48)
(DE82-000845; UCRL-86576; CONF-811046-8) Avail: NTIS HC A02/MF A01

A comparative evaluation of several end plug configurations for tandem mirror fusion reactors with thermal barriers were completed. The axi-cell configuration was selected for further study. The axi-cell end plug has a simple mirror cell produced by two circular coils followed by a transition coil and a yin-yang pair, which provides for MHD stability. DOE

N83-15135# Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
CONCEPTUAL DESIGN FOR A MODULAR-STELLARATOR FUSION-REACTOR MAGNET
S. W. VanSciver, A. Khalil, K. Y. Yuan, and I. N. Sviatoslavsky Oct. 1981 5 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract DE-AS02-78ET-52048)
(DE82-002863; DOE/ET-52048/22; UWFDM-448; CONF-811040-114) Avail: NTIS HC A02/MF A01

The design of a modular stellarator fusion reactor UWTOR-M is examined. The reactor configuration employs 18 twisted toroidal field coils with a major radius of 24.1 m, a minor radius of 4.77 m and a field of 5.5 tesla on axis. The conductor is bath cooled with pressurized superfluid helium to achieve high current density cryostability. The coil case is a stainless steel structure designed to withstand bending moments resulting from self force on the individual coil and the interactive force between adjacent coils. Force components in the radial, poloidal and toroidal directions are calculated for the individual coils using EFFI. These loads are transferred through fiberglass composite struts to a room temperature central concrete column. GRA

N83-15136# California Univ., Livermore. Lawrence Livermore Lab.
MAGNET AND CONDUCTOR DEVELOPMENTS FOR THE MIRROR FUSION PROGRAM
D. N. Cornish 9 Oct. 1981 18 p refs Presented at the US-Japan Superconductive Magnetic Energy Storage Workshop, Madison, Wis., 19-23 Oct. 1981
(Contract W-7405-eng-48)
(DE82-001062; UCRL-86777; CONF-811051-1) Avail: NTIS HC A02/MF A01

The conductor development and the magnet design and construction for the MFTF are described. Future plans for the mirror program and their influence on the associated superconductor development program are discussed. Progress to develop large, high field, multifilamentary Nb3Sn superconductors and the feasibility of building a 12-T yinyang set of coils for the machine to follow MFTF is summarized. Possible magnetic configurations and requirements for mirror reactors are surveyed. GRA

N83-15137# Commissariat a l'Energie Atomique, Villeneuve-Saint-Georges (France). Centre d'Etudes de Limeil.
ACCELERATION OF FAST ELECTRONS IN E.M. FIELDS: PLASMA INTERACTIONS
Xavier Fortin Jun. 1981 18 p Presented at the 11th Anomalous Absorption Conf., Montreal, 2-5 Jun. 1981
(DE81-700583; CEA-CONF-5786; CONF-8106171-1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The study of the electron acceleration by E.M. field is made by considering the ponderomotive force influence, the resonant field influence, and taking into account the time dependence of the electromagnetic field. A simple model gives the temperature and the density gradient in the resonance zone to study the fast-electron spectrum as a function of the E.M. field power. DOE

N83-15138# Commissariat a l'Energie Atomique, Villeneuve-Saint-Georges (France). Centre d'Etudes de Limeil.
GENERATION OF PARTICLE BEAMS IN A 340 kJ PLASMA FOCUS WITH GAS INJECTION BY A FAST VALVE

A. Bernard, J. P. Garconnet, A. Jolas, and J. deMascureau Jul. 1981 8 p refs Presented at the 4th Intern. Topical Conf. on High-Power Electron and Ion-Beam Res. and Technol., Palaiseau, France, 29 Jun. - 3 Jul. 1981
(DE81-700584; CEA-CONF-5798; CONF-810620-20) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A fast valve injects gas transiently near the insulator in order to optimize pressures separately for breakdown and beam generation. On a different machine without gas injection the interaction of the ion beam with targets of variable thicknesses can be used to diagnose the beam. DOE

N83-15139# California Univ., Livermore. Lawrence Livermore Lab.
ANALYTICAL AND NUMERICAL CALCULATIONS OF FIELD-REVERSED THETA-PINCH EQUILIBRIA BASED ON A GENERALIZED HILL'S VORTEX MODEL
D. V. Anderson, J. H. Hammer, and D. C. Barnes Oct. 1981 5 p refs Presented at the 4th Ann. Compact Toroid Symp., Livermore, Calif., 27-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003150; UCRL-86831; CONF-811087-13) Avail: NTIS HC A02/MF A01

Methods for numerically extending the analytic solutions of field reversed theta pinch equilibria so that the results may be used in various stability and dynamics studies were investigated. Generalizations of elliptical Hill's equilibria which accomodate separatrices with more rectangular shapes and which allow plasma to exist outside the separatrix were used. Although the equilibria are specified analytically inside the plasma surface, numerical techniques are required to generate the solution in the vacuum region. Two computer codes were used in sequence. The first determines a set of external coils and their currents so that they match the known coil field inside the plasma. Then, given this coil field, we compute the contribution from the plasma currents to the fields in the vacuum region. DOE

N83-15140# Sandia Labs., Albuquerque, N. Mex.
TRANSPORT OF LIGHT-ION BEAMS IN PLASMA CHANNELS
J. N. Olsen 1981 9 p refs Presented at 9th Symp. on Eng. Problems of Fusion Res., Chicago, Ill., 26 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-001649; SAND-81-1333C; CONF-811040-34) Avail: NTIS HC A02/MF A01

Experimental work of ions which propagated in wire initiated and laser initiated discharge channels is reported. Intense beams of light ions are transported over distances of 1 to 2 meters in plasma channels in progress toward inertial confinement fusion driven by particle beams. Particular emphasis is given to studies on laser initiation and channel stability. GRA

N83-15141# Oak Ridge National Lab., Tenn.
RESISTIVE MHD STUDIES OF HIGH-BETA-TOKAMAK PLASMAS
V. E. Lynch, B. A. Carreras, H. R. Hicks, J. A. Holmes, and L. Garcia 1981 40 p refs Presented at European Workshop on the behavior of Magnetically Confined Plasmas, Wildhaus, Switzerland, 9 Sep. 1981
(Contract W-7405-eng-26)
(DE82-001478; CONF-810947-4-Draft) Avail: NTIS HC A03/MF A01

Numerical calculations have been performed to study the MHD activity in high-delta Tokamaks such as ISX-B. These initial value calculations built on earlier low beta techniques, but the beta effects create several new numerical issues. These issues are discussed and resolved. In addition to time-stepping modules, our system of computer codes includes equilibrium solvers (used to provide an initial condition) and output modules, such as a magnetic field line follower and an X-ray diagnostic code. The transition from current driven modes at low beta to predominantly pressure driven modes at high beta is described. The nonlinear studies yield X-ray emissivity plots which are compared with experiment. DOE

N83-15142# Los Alamos Scientific Lab., N. Mex.
MULTIDIMENSIONAL MHD COMPUTATIONS FOR THE FIELD-REVERSED THETA PINCH AND THE REVERSED-FIELD PINCH
D. D. Schnack 1981 11 p refs Presented at the US/Japan Workshop on 3D MHD Studies for Toroidal Devices, Oak Ridge, Tenn., 19 Oct. 1981
(Contract W-7405-eng-36)
(DE82-004361; LA-UR-81-3527; CONF-8110101-2) Avail: NTIS HC A02/MF A01

Some large scale numerical MHD simulations of field reversed theta pinch and reversed field pinch devices are described. DOE

N83-15143# Sandia Labs., Albuquerque, N. Mex.
DEUTERIUM FLUX MEASUREMENTS IN THE EDGE PLASMAS OF PLT AND PDX DURING AUXILIARY HEATING EXPERIMENTS
W. R. Wampler, S. A. Cohen (Princeton Univ.), H. F. Dylla (Princeton Univ.), D. M. Manos (Princeton Univ.), and C. W. Magee (RCA Labs.) 1981 14 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-001909; SAND-81-2205C; CONF-811113-25) Avail: NTIS HC A02/MF A01

The flux of deuterium in the plasma edge several centimeters outside the limiter were measured using collector probes during neutral beam heating experiments on the PDX Tokamak and RF heating experiments on the PLT Tokamak. The dependence of the flux on the distance from the plasma was determined, and the time dependence of the flux was measured with a time resolution of 90 ms. In PDX the deuterium flux decreased rapidly with increasing distance from the plasma. The deuterium flux increased strongly when the beams came on and decreased when they turned off. The depth distribution of the deuterium in the samples, measured using SIMS, shows that when the beams are on about 30% of the deuterium incident on the probe is superthermal deuterium from the beams. In the deuterium flux decreased only slightly with increasing distance from the plasma. The ICRH heating in PLT caused an increase of about 30% in the flux of deuterium to the samples and in the plasma density. In both machines the the deuterium fluxes were fairly low at the positions sampled. DOE

N83-15144# Technische Hogeschool, Eindhoven (Netherlands). Direct Energy Conversion Group.
EFFECT OF RADIATION AND NON-MAXWELLIAN ELECTRON DISTRIBUTION ON RELAXATION PROCESSES IN AN ATMOSPHERIC CESIUM SEEDED ARGON PLASMA
C. A. Borghi, A. Veefkind, and J. M. Wetzer Mar. 1982 30 p refs
(EUT-82-E-124; ISBN-90-6144-124-2) Avail: NTIS HC A03/MF A01

A model, describing the time dependent behavior of a noble gas MHD generator plasma, was set up. The model calculates the relaxation for ionization or recombination as a stepwise temperature development, once the initial and final conditions are given. Radiative transitions and a deviation from Maxwellian electron distribution are included in the model. Radiation causes an enhancement of both the ionization relaxation time and the recombination relaxation time. A non-Maxwellian electron distribution results in an increase of the relaxation time for an ionizing plasma because of an underpopulation of the high energy electrons. A decrease of the relaxation time for a recombining plasma is caused by an overpopulation of high energy electrons. The relaxation time is strongly dependent on the seed ratio and the temperature step. Author (ESA)

N83-15145# Kiruna Geophysical Inst. (Sweden).
WAVES IN HOMOGENEOUS, ANISOTROPIC MULTICOMPONENT PLASMAS (WHAMP)
Kjell Roennmark (Umeaa Univ., Sweden) Jun. 1982 57 p refs (KGI-179; ISSN-0347-6405) Avail: NTIS HC A04/MF A01

A computer program which solves the dispersion relation of waves in a magnetized plasma is described. The dielectric tensor

is derived using the kinetic theory of homogeneous plasmas with Maxwellian velocity distributions. Up to six different plasma components can be included in the program, and each component is specified by its density, temperature, particle mass, anisotropy and drift velocity along the magnetic field. The program is thus applicable to a very wide class of plasmas, and the method should in general be useful whenever a homogeneous magnetized plasma can be approximated by a linear combination of Maxwellian components. The general theory underlying the program is outlined. It is shown that by introducing a Pade approximant for the plasma dispersion function Z, the infinite sums of modified Bessel functions which appear in the dielectric tensor may be reduced to a summable form. Author (ESA)

N83-15146# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
PARADIGM TRANSITION IN COSMIC PLASMA PHYSICS
Hannes Alfven Jun. 1982 43 p refs Presented at Conf. on Plasma Phys., Gotthenburg, Sweden, Jun. 1982
(TRITA-EPP-82-04; ISSN-0340-7539) Avail: NTIS HC A03/MF A01

The evolution of cosmic plasma physics is discussed. General laws governing cosmic plasmas are derived from laboratory and magnetospheric measurements, and applied to solar, interstellar, galactic and cosmological problems. The double layers in cosmic plasmas, the discovery of the inverted V events, the energy transfer in auroral circuits, are discussed in particular. The applications to solar wind-magnetospheric interaction, to cosmology and to solar system evolution are examined. It is shown that the existence of large quantities of antimatter in the universe is quite possible and that the energy release in quasars may be better explained by matter annihilation. Growing doubts about the big bang theory are postulated. Author (ESA)

N83-15147# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
ON THE PHYSICS OF RELATIVISTIC DOUBLE LAYERS
P. Carlqvist Jun. 1982 31 p refs Submitted for publication
(TRITA-EPP-82-05; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

A model of a strong, time-independent, relativistic double layer is studied. Besides double layers having the electric field parallel to the current, the model also describes a certain type of oblique double layer. The Langmuir condition (ratio of ion current density to electron current density) as well as an expression for the potential drop of the double layer are derived. The distributions of charged particles, electric field, and potential within the double layer are clarified and discussed. It is found that the properties of relativistic double layers differ substantially from the properties of corresponding nonrelativistic double layers. Author (ESA)

N83-15222# Weizmann Inst. of Science, Rehovoth (Israel).
ON THE MECHANISM OF THERMALIZATION A PLASMA INFALLING ONTO MAGNETIZED NEUTRON STARS
R. Z. Yahel *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 289-292 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15224# Tuebingen Univ. (West Germany). Lehrstuhl fuer Theoretische Astrophysik.
ELECTRON-PHOTON INTERACTION IN HOT STRONGLY MAGNETIZED PLASMAS
H. Herold *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 296-298 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N83-15148*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN INVESTIGATION OF IMPURITY CENTERS IN SEMICONDUCTORS OF VARIABLE COMPOSITION. PART 1: GENERAL THEORY AND SOME APPLICATIONS
O. H. vonRoos 15 Oct. 1982 54 p refs Sponsored by NASA (MIPR FY1455-82N0607)
(NASA-CR-169659; JPL-Pub-82-88-Pt-1; NAS 1.26:169659) Avail: NTIS HC A04/MF A01 CSCL 20L

A theory of deep point defects imbedded in otherwise perfect semiconductor crystals is developed with the aid of pseudopotentials. The dominant short-range forces engendered by the impurity are sufficiently weakened in all cases where the cancellation theorem of the pseudopotential formalism is operative. Thus, effective-mass-like equations exhibiting local effective potentials derived from nonlocal pseudopotentials are shown to be valid for a large class of defects. A two-band secular determinant for the energy eigenvalues of deep defects is also derived from the set of integral equations which corresponds to the set of differential equations of the effective-mass type. Subsequently, the theory in its simplest form, is applied to the system Al(x)Ga(1-x)As:Se. It is shown that the one-electron donor level of Se within the forbidden gap of Al(x)Ga(1-x)As as a function of the AlAs mole fraction x reaches its maximum of about 300 meV (as measured from the conduction band edge) at the cross-over from the direct to the indirect band-gap at $x = 0.44$ in agreement with experiments.
M.G.

N83-15149*# National Aeronautics and Space Administration. Pasadena Office, Calif.
TOTAL IMMERSION CRYSTAL GROWTH Patent Application
Andrew D. Morrison, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 18 Nov. 1982 21 p
(Contract NAS7-100)
(NASA-Case-NPO-15800-1; US-Patent-Appl-SN-442815) Avail: NTIS HC A02/MF A01 CSCL 20B

Crystals of wide band gap materials are produced by positioning a holder receiving a seed crystal at the interface between a body of molten wide band gap material and an overlying layer of temperature-controlled, encapsulating liquid. After initiation of crystal growth, the crystal is pulled through the layer until the crystal is solidified. The crystal then enters the ambient gas headspace which may also be temperature controlled. The crystal can be pulled vertically by means of a pulling-rotation assembly or horizontally by means of a low-angle withdrawal mechanism. The encapsulating layer is controlled by heating and/or cooling elements submerged with the layers and connected in closed loop with power supplies by means of temperature sensing elements. These elements control and provide nucleation and growth of a more perfect crystal in the elongated, heat exchange, encapsulating fluid medium. NASA

N83-15150# Ceres Corp., Waltham, Mass.
GROWTH OF HIGH PURITY OXYGEN-FREE SILICON BY COLD CRUCIBLE TECHNIQUES Final Technical Report, 18 May 1980 - 30 Nov. 1981
Joseph F. Wenckus and Wilson P. Menashi Griffiss AFB, N.Y. RADC Jun. 1982 111 p refs
(Contract F19628-80-C-0104; AF Proj. 4600)
(AD-A118992; RADC-TR-82-171) Avail: NTIS HC A06/MF A01 CSCL 13/8

The goal of the program was to explore the feasibility of utilizing a cold crucible system for the growth of high purity, oxygen-free single crystals of silicon. The work included a detailed evaluation of previous research on cold crucible technology, the design and construction of a cold crucible assembly and the investigation of the growth of single crystals of high purity silicon utilizing the

water-cooled cold crucible. In parallel with the experimental work, a theoretical analysis was carried out on the thermodynamics and heat flow characteristics within the melt confined in the cold crucible in an effort to develop a better understanding of the crystal growth process. The goals of the program have been achieved. GRA

N83-15151# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
CHARACTERIZATION OF THE INTERFACE ENERGETICS FOR N-TYPE CADMIUM SELENIDE/NON-AQUEOUS ELECTROLYTE JUNCTIONS Interim Technical Report
A. Aruchamy, James A. Bruce, Shinichi Tanaka, and Mark S. Wrighton 27 Aug. 1982 35 p refs Submitted for publication
(Contract N00014-75-C-0880; NR Proj. 051-579)
(AD-A119304; TR-35) Avail: NTIS HC A03/MF A01 CSCL 20/12

Single-crystal, n-type CdSe photoanodes have been studied in 0.1 M (n-Bu4N)aCl04/CH3CN solutions containing low concentrations of fast, outer-sphere, one electron redox reagents. A number of redox couples were studied spanning a wide range of redox potentials. We find that reversible electrochemical response is seen at both dark and illuminated (632.8 nm light) n-CdSe for couples with redox potentials more negative than -1.2 V vs. SCE, e.g. Ru(bpy)3(2+/+/0/-. For couples with redox potentials positive of -1.2 V vs SCE we find that CdSe is blocking to the oxidation of the reduced form of the redox couple in the dark, but illumination results in its oxidation. The photoanodic current peak in a cyclic voltammogram occurs more negative than at a Pt electrode, the difference between theses values is the photovoltage, EV, taken to approximate the barrier height, EB. The effect of a number of different etches on the interface energetics of CdSe was investigated, since it was previously determined that an oxidizing or reducing etch would yield quite different results for n-CdTe. For CdSe, however, the different etches do not give significantly different results with respect to EB vs redox potentials, despite large variation in surface composition deduced from Auger and XPS spectra. GRA

N83-15152# Georgia Inst. of Tech., Atlanta. School of Physics.
CORRELATION AND COLLECTIVE MODES IN NARROW BAND MATERIALS Interim Report, 1 Oct. 1980 - 30 Sep. 1981
Martin W. Ribarsky 25 May 1982 29 p refs
(Grant AF-AFOSR-0023-80; AF Proj. 2301)
(AD-A119188; AFOSR-82-0711TR) Avail: NTIS HC A03/MF A01 CSCL 20/14

Correlation and collective modes have been studied for systems with quite localized valence or conductive bands. In particular this research has been concerned with localized electron-hole states and how they contribute with other excitations to the dynamical response of the system. The most important aspect studied has been the effect of excitons or exciton-like states on superconducting properties. Initially the system studied has been Cu2O for which a simplified tight-binding model was used. The results showed that an effective attractive interaction between electrons due to the local field produced by interacting electron-hole pairs was possible. Under the appropriate conditions this interaction could lead to a superconducting state. The contribution of the localized excitation structure and plasmon modes to the electronic loss spectra was also analyzed. Here the effect of the primary electron energy on the plasmon peak position was shown to be significant. Author (GRA)

N83-15153# SRI International Corp., Menlo Park, Calif.
PIEZORESISTANCE RESPONSE OF YTTERBIUM UNDER STATIC AND DYNAMIC LOADING Final Technical Report, Jan. 1981 - Jan. 1982
Y. M. Gupta and D. F. Walter Apr. 1982 26 p refs
(Contract F49620-81-K-0002; AF Proj. 2307; SRI Proj. 2658)
(AD-A119186; AFOSR-82-0689TR) Avail: NTIS HC A03/MF A01 CSCL 20/3

Resistance change measurements in ytterbium foils (encapsulated in a PMMA matric) subjected to quasi-static triaxial (to 0.4 GPa) and shock wave loading (to 1.2 GPa) have been obtained. The use of a solid matrix in the quasi-static experiments is a new feature and ensures consistent comparisons between the two types of experiments. Two sets of gauge orientations, with respect to the matrix stresses, were examined in each type of experiment. Experimental results were analyzed in terms of the recently developed theoretical analysis. Both sets of experimental data confirm the general theoretical framework; an important difference between the static and dynamic measurements can be explained on the basis of the inclusion analysis. Results from these data have pointed out areas in need of refinement in the theoretical work and provided calibration data for lateral stress measurement in uniaxial strain experiments. These necessary theoretical developments, along with a determination of the piezoresistive coefficients, will be examined in the future. Author (GRA)

N83-15154# Stanford Univ., Calif. Electronics Labs.
STUDY OF THE ELECTRONIC SURFACE STATES OF 3-V COMPOUNDS AND SILICON Semiannual Technical Progress Report, 1 Oct. 1981 - 31 Mar. 1982
W. E. Spicer and I. Lindau 31 Mar. 1982 158 p refs
(Contract N00014-79-C-0072; DARPA Order 3564)
(AD-A119737) Avail: NTIS HC A08/MF A01 CSCL 20/8

Contents: The Ge-Ag Interface at Room Temperatures: An Energy Dependent Photoemission Study; The Si(III)/Pt Interface at Room Temperature: An Synchrotron Radiation Photoemission Study, Photoemission Investigation on the Oxidation of Si(III)-Ag Interfaces and Its Relation to the Interface Structure; Intermixing at the Early Stage of the Si(III)/Ag Interface Growth, Photoemission Studies of As and Its Room Temperature Oxidation; Photoemission Studies of Room-Temperature Oxidized Surfaces, Development and Confirmation of the Unified Model for Schottky Barrier Formation and MOS Interface States on III-V Compounds; Reply to "Surface Photovoltage Measurements and Fermi Level Pinning: comments on Developoment and Confirmation of the Unified Model for Schottky Barrier Formation and MOS Interface States on III-V Compounds" to be published in Thin Solid Films, The Use of Synchrotron Radiation to Study Oxygen and Metal Overlayers on GaAs (110) Surfaces; and Modified Schottky Barrier Heights by Interfacial Doped Layers: MBE Al on GaAs. GRA

N83-15155# Hughes Research Labs., Malibu, Calif.
ELECTRONIC PROCESSES IN InP AND RELATED COMPOUNDS Final Report, 10 Oct. 1980 - 9 Oct. 1981
K. V. Vaidyanathan, C. L. Anderson, H. L. Dunlap, and G. S. Kamath Jul. 1982 53 p refs
(Contract N00019-80-C-0619)
(AD-A119534) Avail: NTIS HC A04/MF A01 CSCL 20/13

The growth and characterization of high-purity epitaxial layers grown by liquid-phase-epitaxy (LPE) are described. Chemical and electrical evaluation of the layers indicate that silicon and sulfur are the dominant residual donors in LPE-grown InP layes. Techniques for controlling these dopants are discussed. The current-voltage characteristics of Schottky diodes on p-InP are analyzed. Aluminum, silver, and gold were tried as Schottky-barrier metals. The results reported here demonstrate that Al is the best choice as the Schottky metal. An automated system has been used to measure the relative photoresponse from Schottky diodes. Photocurrent measurements due to pure electron and pure hole injection have been made as a function of bias applied to the sample. This data has been analyzed to yield ionization coefficients of electrons (alpha) and holes (beta) in InP. The results clearly demonstrate that holes have a larger ionization coefficient than electrons in InP. Author (GRA)

N83-15156# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
MICROGRAPHIC OBSERVATIONS OF THE CARBONACEOUS MESOPHASE BY A QUENCHING HOT STAGE
Jack L. White, Manfred Buechler, and Cassandra B. Ng 30 Aug. 1982 11 p refs
(Contract F04701-81-C-0082)
(AD-A119793; TR-0082(2935-02)-2; SD-TR-82-51) Avail: NTIS

HC A02/MF A01 CSCL 20/2

A hot-stage microscope with quenching capability was employed to relate the observations made at the free surface of a pitch during pyrolysis to the bulk microstructure. Freshly formed mesophase spherules display an 'iceberg effect' with only a limited upper segment exposed to view. The mesophase layers tend to lie normal to the free surface, and + or - 2 Pi as well as + or - Pi disclinations display discontinuous cores at the free surface; aside from these minor effects, surface observations appear to be representative of events taking place within the bulk mesophase. Author (GRA)

N83-15157# Toulouse Univ. (France).

STUDY OF THERMOLUMINESCENCE AND SEMICONDUCTORS IN DOSIMETRY. APPLICATION OF DOSIMETRY OF THE WHOLE BODY IN VIEW OF BONE MARROW GRAFTING Ph.D. Thesis

Suzanne Naudy May 1981 139 p refs In FRENCH (FRNC-TH-1047) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

It is deduced that thermoluminescence remains the most reliable process for the measurement of dose in vivo: precision, reproducibility, and easy calibration. The semiconductors do not present the quality needed for a reliable use in dosimetry. The limits of each technique were established and they were each applied simultaneously in dosimetric irradiations of the whole body in view of bone marrow grafting. Semiconductors allow one to follow the irradiation and to intervene instantaneously if necessary; thermoluminescent dosimeters insure precise knowledge of the delivered dose. One hundred and ten patients were treated before bone marrow grafting and fifty-two of them render account of the results obtained with this experimental dosimetric protocol. DOE

N83-15158# Fraunhofer-Inst. fuer Festkoerpertechnologie, Munich (West Germany).

APPLICATION AND FURTHER DEVELOPMENT OF ION IMPLANTATION FOR VERY LARGE SCALE INTEGRATION, PART 2 Final Report, Mar. 1982

Karl Haberger, Heiner Ryssel, and Klaus Hoffmann Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 35 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.

(BMFT-FB-T-82-120; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,50

The suitability of a finely focused ion beam for direct writing implantation was investigated. The ion accelerator was equipped with a computer controlled fine focusing system. Using this system it was possible to implant Van-der-Pauw test structures, resistors, and bipolar transistors, which were then electrically measured. The smallest line width was approximately 1 micron. A disadvantage is represented by the long implantation times with present ion sources. Another VLSI-relevant area of application for this finely focused ion-beam-writing system is photoresist exposure, as an alternative to electron beam lithography, making possible the realization of very small structures without proximity effects and with a significantly higher resist sensitivity. Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N83-15159# Tel-Aviv Univ. (Israel).

ADVANCES IN SUPERGRAVITY

Yuval Neeman Jul. 1981 28 p refs Presented at the Conf. on Differential Geometric Methods in Theoret. Phys., Trieste, Italy, Jul. 1981 Sponsored in part by the US-Israel Binational Science Foundation (Contract DE-AS05-76ER-03992)

(DE82-001748; DOE/ER-03992/463; CONF-810766-1) Avail: NTIS HC A03/MF A01

The key achievements in supergravity are reviewed including the following items: (1) 2 loop finiteness of quantum gravity, including the presence of matter - provided that this matter, together with the gravitational field, form an appropriate extended supermultiplet; (2) 3 loop super renormalizability of a sample theory (N = 4 Super-Yang Mills), resembling N = 8 extended supergravity; (3) vanishing of geometrical counter-terms for a loops, n < N; (4) positive definiteness of the gravitational Hamiltonian; (5) the removal of the Johnson-Sudarshan and other inconsistencies, which used to plague spin 3/2 theories. The N = 8 theory is emphasized and attempts to provide it with a phenomenological interpretation are discussed. DOE

N83-15160# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Service de Physique Theorique.

SCATTERING IN QUANTUM FIELD THEORY: THE M.P.S.A. APPROACH IN COMPLEX MOMENTUM SPACE

J. Bros Feb. 1981 56 p refs Presented at the 20th Schladming Winter School of Theoret. Phys., Austria, 15-27 Feb. 1981

(DE81-700563; CEA-CONF-5768; CONF-810272-2) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The singularities (location, nature, type of ramification) and the ambient holomorphy (or metromorphy) domains of the n-point Green functions and scattering amplitudes, and analytic structural equations for them which display the global organization of these singularities are discussed. The generation of Landau singularities for integrals and Fredholm resolvents, taken on cycles in complex space, is explained on the basis of the Picard-Lefschetz formula (presented and used in simple situations). A structural equation for the six-point function valid in a domain containing the three-particle normal threshold is presented. DOE

N83-15161# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.

HIGHER ORDER REGGEON FIELD THEORY RESULTS FOR dSIGMA/dt

Claude Bourrely and Jan W. Dash Mar. 1981 14 p refs

(DE81-700139; CNRS-CPT-81-P-1280) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The critical Reggeon Field Theory (RFT) asymptotic scaling law for dsigma/dt can be evaluated using the epsilon expansion for renormalization group (RG) quantities at t not equal to 0 along with the two variable RG equations found by Abarbane, Bartels, Bronzan, and Sidhu (ABBS). The amplitude thus obtained has an epsilon-exponentiated form. Interestingly, it reduces in a certain limit to the Bessel function Pomeron model advocated by Kane. Although the asymptotic RFT scaling is violated by the data, introduction of a mild external particle vertex with one parameter improves the situation considerably at current energies. Moreover, the shape of the ABBS scaling curve predicted by the 0(epsilon x epsilon) results of Dash and Grandou is in at least qualitative agreement with the data, including the absence of a second dip. Two additional parameters (the t = 0 normalization and the scale in t) have to be fixed by hand. DOE

N83-15162# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. of Theoretical and Experimental Physics.

QUANTUM CHROMODYNAMICS AS DYNAMICS OF LOOPS

Yu. Makeenko and A. A. Migdal 1980 36 p refs

(ITEP-23(1980)) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The problem of a possibility of reformulating quantum chromodynamics (QCD) in terms of colorless composite fields instead of colored quarks and gluons is considered. The role of such fields is played by the gauge invariant loop functionals. The Shwinger equations of motion is derived in the loop space which completely describe dynamics of the loop fields. New manifestly gauge invariant diagram technique in the loop space is developed.

These diagrams reproduce asymptotic freedom in the ultraviolet range and are consistent with the confinement law in the infrared range. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N83-15163*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
THE 1982 NASA/ASEE SUMMER FACULTY FELLOWSHIP RESEARCH PROGRAM, ABSTRACTS OF RESEARCH PROJECTS, 1ST AND 2ND-YEAR FELLOWS Final Report
Sep. 1982 96 p refs
(NASA-CR-169614; NAS 1.26:169614) Avail: NTIS HC A05/MF A01 CSCL 05I

Phosphine photolysis in Jupiter's atmosphere is discussed in relation to organic chemical evolution. Workload in AFTI F-16 test flights, infrared observations of M17, and the relation between rock and vegetation types are presented. Orbiter transfer vehicle aerothermodynamics simulation problems are also discussed. S.L.

N83-15164*# Howard Univ., Washington, D. C.
THE 1982 ASEE-NASA FACULTY FELLOWSHIP PROGRAM (AERONAUTICS AND RESEARCH) Final Report
Dah-Nien Fan (Howard Univ.), Jerry R. Hodge (Maryland Univ., College Park), and Fawzi P. Emadi Sep. 1982 67 p refs
(Grant NGT-09-011-060)
(NASA-TM-85158; NAS 1.15:85158) Avail: NTIS HC A04/MF A01 CSCL 05I

The NASA/ASEE Summer Faculty Fellowship Program (Aeronautics and Research) conducted at the NASA Goddard Space Flight Center during the summer of 1982 is described. Abstracts of the Final Reports submitted by the Fellows detailing the results of their research are also presented. L.F.M.

N83-15165*# Alabama Univ., University. Bureau of Engineering Research.
THE 1982 NASA/ASEE SUMMER FACULTY FELLOWSHIP RESEARCH PROGRAM Final Administrative Report
Sep. 1982 93 p refs
(NASA-CR-169619; NAS 1.26:169619) Avail: NTIS HC A05/MF A01 CSCL 05I

Aht NASA/ASEE Summer Faculty Fellowship Research Program conducted at the Marshall Space Flight Center by the University of Alabama at Huntsville, Ala. during the summer of 1982 is described. Abstracts of the Final Reports submitted by the Fellows detailing the results of their research are also presented. L.F.M.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N83-15166# Comptroller General of the United States, Washington, D.C.
DEPARTMENT OF COMMERCE COULD SAVE $24.6 MILLION BY MODIFYING COMPUTER PROCUREMENT ACTIONS
28 Apr. 1982 11 p
(GAO/CED-82-81) Avail: NTIS HC A02/MF A01

The computer requirements of the National Bureau of Standards (NBS) and he Environmental Research Laboratories (ERL) were reviewed. Topics investigated include: (1) the feasibility of consolidating the requirements of NBS and ERL and establishing a single data processing center for both organizations; (2) the best location for a single data processing center; (3) the expected cost savings from establishing this center; and (4) the feasibility of a single telecommunications network. Workload justification for two ongoing requests for proposals for acquiring computer hardware and support services for NBS and ERL was also examined. Results indicate that it is feasible to consolidate NBS' and ERL's computer requirements and establish a single data processing center for both organizations. But the cost of a single general-purpose facility to meet the requirements of both agencies exceeds the cost of maintaining two separate general-purpose facilities by several million dollars. Further, the quality of service provided by a single facility may be less than that provided by two. Savings and improved service could result, however, if certain needs of both agencies for a large-scale, scientifically oriented computer were met through sharing. J.M.S.

N83-14340*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEEP SPACE NETWORK UTILIZATION FOR FLIGHT PROJECTS, CALENDAR YEAR 1981
C. L. Adkins and E. K. Goto *In its* The Telecommun. and Data Acquisition Progr. J. 15 Nov. 1982 p 143-147 refs (For primary document see N83-14323 05-32)
Avail: NTIS HC A09/MF A01 CSCL 05A

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N83-15167# Office of Technology Assessment, Washington, D.C.
COMPUTER-BASED NATIONAL INFORMATION SYSTEMS. TECHNOLOGY AND PUBLIC POLICY ISSUES: SUMMARY
Oct. 1981 27 p refs
(OTA-CIT-147) Avail: NTIS HC A03/MF A01

The use of computer technology in national information systems and related public policy issues are summarized. A general introduction to computer-based national information systems; a framework for understanding computer and information policy issues, and several of the more important issue areas; a state-of-the-art survey of computer and related technologies and industries; and a foundation for three related studies in the areas of computerized criminal history records, electronic mail, and electronic funds transfer are provided. Author

N83-15168*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RESEARCH AND TECHNOLOGY, FISCAL YEAR 1982 Annual Report, 1982
Nov. 1982 86 p refs
(NASA-TM-82506; NAS 1.15:82506) Avail: NTIS HC A05/MF A01 CSCL 05B

Advanced studies are reviewed. Atmospheric sciences, magnetospheric physics, solar physics, gravitational physics, astronomy, and materials processing in space comprise the research programs. Large space systems, propulsion technology, materials and processes, electrical/electronic systems, data bases/design criteria, and facilities development comprise the technology development activities. N.W.

N83-15169*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESEARCH AND TECHNOLOGY, LEWIS RESEARCH CENTER Annual Report, 1982
1982 47 p refs
(NASA-TM-83038; NAS 1.15:83038) Avail: NTIS HC A03/MF A01 CSCL 05B

Aeronautics, space, and terrestrial energy research is covered. Energy conversion processes and systems for propulsion in the atmosphere, in space, and on the ground are reviewed. Electric energy generation and storage for both terrestrial and space

applications and materials and structures for such systems are also reviewed. N.W.

N83-15170# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
PROCEEDINGS OF THE UNITED STATES AIR FORCE STINFO OFFICERS POLICY CONFERENCE
James G. Johnson Aug. 1982 225 p refs Conf. held at Wright-Patterson AFB, Ohio, 1981
(AD-A118935; AFWAL-TR-82-0002) Avail: NTIS HC A10/MF A01 CSCL 05/1

Approximately 100 technical information specialists participated in the conference at Wright-Patterson AFB, Ohio. As a result of the conference, the following principal issues will be pursued to improve the USAF STINFO program; (1) more emphasis on STINFO in major commands (SAC, MAC, TAC, etc.); (2) resurrection of a STINFO training program; (3) more emphasis on getting information to the scientist/engineer/manager; and (4) improvement of the communications between and within the STINFO program. Author (GRA)

N83-15171# National Academy of Sciences - National Research Council, Washington, D. C. Numerical Data Advisory Board.
NUMERICAL DATA ADVISORY BOARD REPORT OF ACTIVITIES PERFORMED FOR THE PERIOD 1 JULY 1980 - 30 JUNE 1981
30 Jun. 1981 30 p
(Contract NB-80-NADA-1036; Grants DE-FG02-80ER-10760; NSF IST-80-1960)
(DE82-002168; DOE/ER-10760/1) Avail: NTIS HC A03/MF A01

The improvement in quality, reliability, availability, accessibility, dissemination, utilization, and management of data is discussed. NDAB seeks to promote an appreciation of the importance of evaluated data to scientists, engineers, regulators, and others who require reliable numerical data for research and for decision making. NDAB is an interdisciplinary body with representation from physical, chemical, engineering, biological, and geological sciences. Selected sociotechnical, socioeconomic, and transient, or soft data topics are also covered. An effective path of communication with international data activities is maintained by scheduling NDAB meetings jointly with the US National Committee for CODATA, the Committee on Data for Science and Technology of the International Council for Scientific Unions (ICSU). An active government liason relationship is maintained to facilitate input from, and discussion with branches of agencies that deal with technical data and information programs. DOE

N83-15172# Oak Ridge National Lab., Tenn.
PRODUCTIVITY MONITORING AND ANALYSIS IN THE PUBLICATIONS OFFICE: TECHNIQUES FOR THE NONSTATISTICIAN
T. W. Robinson 1981 15 p Presented at the Practical Conf. on Commun., Knoxville, Tenn., 23 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002892; CONF-81110100-2) Avail: NTIS HC A02/MF A01

Several analytical methods are described that are based on common mathematical functions and, depending on the size of the organization, normally do not require computer support. Examples of the uses of time, cost, and volume data for assessing the operating effectivenesses of various publications-related functons are presented and explained, and inherent limitations of the statistical approach are identified. DOE

N83-15173# International Development Research Centre, Ottawa (Ontario).
INTERNATIONAL COOPERATIVE INFORMATION SYSTEMS
1980 111 p refs In FRENCH and ENGLISH
(IDRC-156e) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

Developing countries need mechanisms by which the information they generate themselves and development information from the rest of the world can be retrieved. The international cooperative information system is such a mechanism. Delegates to the Seminar on International Cooperative Information Systems were informed about various existing systems (INIS, AGRIS, INFOTERRA, TCDC/INRES, POPIN, DEVSIS, and INPADROC), some specialized information systems and services (CDS/ISIS and the Cassava Information Centre), and computer programs for information processing (INIS/AGRIS, CDS/ISIS, and MINISIS). The participants suggested some changes that should be made on both the national and the international levels to ensure that these systems meet the needs of developing countries more effectively. DOE

N83-15174# Technische Hogeschool, Eindhoven (Netherlands). Measurement and Control Group.
MODEL STRUCTURE SELECTION IN LINEAR SYSTEM IDENTIFICATION: SURVEY OF METHODS WITH EMPHASIS ON THE INFORMATION THEORY APPROACH
A. Krolikowski Jun. 1982 70 p refs Sponsored by Netherlands Ministry of Education and Sciences
(EUT-82-E-126; ISBN-90-6144-126-9; ISSN-0167-9708) Avail: NTIS HC A04/MF A01

Model structure selection in linear system identification, particularly the determination of the model order is investigated. Order tests for single-input single-output systems were surveyed. Methods for model structure identification in multi input - multi output system are presented. Emphasis was put on the model structure selection methods derived using an information theory approach, i.e., Akaike's information criterion (AIC), and Rissanan's criteria. The development of Rissanen's proposals is presented by describing the following criteria : the minimum entropy criterion, the shortest data description criterion and the minimum description length criterion. These criteria, although having good theoretical background, still need practical verification. Author (ESA)

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N83-15175*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AUTOMATED MIXED TRAFFIC VEHICLE DESIGN AMTV 2
Alan R. Johnston, Richard A. Marks, and Paul L. Cassell Jan. 1982 74 p refs
(Contract DOT-AT-60008-T)
(NASA-CR-169658; JPL-Pub-82-58; NAS 1.26:169658; UMTA-CA-06-0088-82-1) Avail: NTIS HC A04/MF A01 CSCL 13F

The design of an improved and enclosed Automated Mixed Traffic Transit (AMTT) vehicle is described. AMTT is an innovative concept for low-speed tram-type transit in which suitable vehicles are equipped with sensors and controls to permit them to operate in an automated mode on existing road or walkway surfaces. The vehicle chassis and body design are presented in terms of sketches and photographs. The functional design of the sensing and control system is presented, and modifications which could be made to the baseline design for improved performance, in particular to incorporate a 20-mph capability, are also discussed. The vehicle system is described at the block-diagram-level of detail. Specifications and parameter values are given where available. Author

N83-15176*# Mechanical Technology, Inc., Latham, N. Y. Stirling Engine Systems Div.
AUTOMOTIVE STIRLING ENGINE DEVELOPMENT PROGRAM Semiannual Technical Progress Report, 1 Jul. - 31 Dec. 1981
W. Ernst, S. Piller, A. Richey, M. Simetkosky, and M. Antonelli, ed. Sep. 1982 84 p refs
(Contracts DEN3-32; EC-77-A-31-10040)
(NASA-CR-167907; NAS 1.26:167907; DOE/NASA-0032-15; Rept-82ASE248SA1; SATPR-1) Avail: NTIS HC A05/MF A01 CSCL 13F

Activities performed on Mod I engine testing and test results, progress in manufacturing, assembling and testing of a Mod I engine in the United States, P40 Stirling engine dynamometer and multifuels testing, analog/digital controls system testing, Stirling reference engine manufacturing and reduced size studies, components and subsystems, and computer code development are summarized. Author

N83-15177*# Mechanical Technology, Inc., Latham, N. Y. Stirling Engine Systems Div.
AUTOMOTIVE STIRLING ENGINE DEVELOPMENT PROGRAM Semiannual Technical Progress Report, 1 Jan. - 30 Jun. 1982
N. Nightingale, W. Ernst, A. Richey, M. Simetkosky, and M. Antonelli, ed. Oct. 1982 65 p ref
(Contracts DEN3-32; EC-77-A-31-10040)
(NASA-CR-167907; NAS 1.26:167907; DOE/NASA-0032-15; Rept-82ASE278SA2; SATPR-2) Avail: NTIS HC A04/MF A01 CSCL 13F

Activities performed on Mod I engine testing and test results; the manufacture, assembly, and test of a Mod I engine in the United States; design initiation of the Mod I-A engine system; transient performance testing; Stirling reference engine manufacturing and reduced size studies; components and subsystems; and the study and test of low cost alloys are summarized. Author

N83-15178# California Univ., Berkeley. Lawrence Berkeley Lab.
TECHNOLOGY TRANSFER ACTIVITIES AT THE LAWRENCE BERKELEY LABORATORY
R. M. Lemmon Oct. 1981 21 p
(Contract W-7405-eng-48)
(DE82-003055; PUB-422) Avail: NTIS HC A02/MF A01

Research activities at the Lawrence Berkeley Laboratory are described concerning X-ray fluorescence analysis; magnetotellurics in geological exploration; solid-state ballasts for fluorescent lamps; medical imaging; and neutral beam sources. DOE

88 SPACE SCIENCES (GENERAL)

N83-15179# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
ACCRETING NEUTRON STARS
Wolfgang Brinkmann, ed. and Joachim Truemper, ed. Oct. 1982 351 p refs Proc. of workshop held in Garching, West Germany, 19-23 Jul. 1982
(MPE-177; ISSN-0340-8922) Avail: NTIS HC A16/MF A01

X-ray binaries and gamma-ray bursters are discussed. For individual titles, see N83-15180 through N83-15231.

N83-15180# Oxford Univ. (England). Dept. of Astrophysics.
OPTICAL OBSERVATIONS OF BINARY X-RAY SOURCES c89
Philip A. Charles *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 1-13 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Massive X-ray binaries are discussed. Low mass X-ray binaries are also discussed. Optical bursters, a standard disc model, accretion disk coronae, and soft X-ray transients are included. N.W.

N83-15181# Nagoya Univ. (Japan). Dept. of Astrophysics.
VARIATIONS OF PULSE PERIODS OF X-RAY PULSARS c90
S. Hayakawa and F. Nagase *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 14-28 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Among several X-ray pulsars thus far observed by HAKUCHO, complex time variations of pulse periods have been obtained for Cen X-3, Vela X-1 AO535+26, and GX301-2, which are known to be members of binary systems of finite eccentricities. The rates of long-term pulse period change for these pulsars are not constant, if incorporated with earlier observations, and sometimes change their signs. For Vela X-1 the rates of period change were obtained for 11 data sets, each extending over about one orbital periods. A large variation of pulse period from one orbital period to another indicates that a long-term period variation results from an average of short-term period fluctuations. The mechanism of period fluctuations is discussed in connection with the matter accretion fed by stellar wind. Author

N83-15182*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE OBSERVED PROPERTIES OF X-RAY PULSARS c89
N. E. White *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 29-40 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01 CSCL 03A

A unified description of the properties of the 14 X-ray pulsars is summarized. Properties of X-ray pulsars and obvious correlations with luminosity are outlined. Author

N83-15183*# California Univ., San Diego. Center for Astrophysics and Space Science.
HARD X-RAY OBSERVATIONS OF FAST PULSARS FROM HEAO-1 c89
Duane E. Gruber and Francis A. Primini (MIT) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 41-52 refs (For primary document see N83-15179 05-88)
(Contracts NAS8-27974; NAS8-27975)
Avail: NTIS HC A16/MF A01 CSCL 03C

A favorable combination of sensitive area and viewing time for the UCSD/MIT Hard X-Ray and Gamma-Ray Telescope on satellite HEAO-1 permitted significant contributions to the study of binary systems. Results are reviewed for five fast pulsars: Her X-1, 4U0115+63, LMC X-4, SMC X-1 and Cen X-3. Author

N83-15184# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
GX 301-2: THE 41.5 DAY PERIOD AND ITS OPTICAL COUNTERPART c89
Manfred W. Pakull *In its* Accreting Neutron Stars Oct. 1982 p 53-56 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Photoelectric observations of Wra 977 the optical counterpart of GX 301-2 (= 4U 1223-62) are analyzed to explore whether interaction effects due to the orbiting X-ray pulsar are present in the light curve of the B1 type supergiant. The material consists of 245 nightly mean brightness measurements. The periodogram analysis is consistent with a small modulation of the optical

brightness of Wra 977 with the 41.5 day cycle which is superimposed on much larger (8%) semiperiodic light variations on timescales of between 7 and 13 days typical for early type supergiant stars. The resulting mean light curve peaks near periastron passage/X-ray outburst of the accreting neutron star. Possible explanations in terms of X-ray heating and tidal distortions are discussed and the relation to variable lightcurves of other massive X-ray binary systems is pointed out. Author

N83-15185# Institute of Space and Astronautical Science, Tokyo (Japan).
HARD X-RAY RECURRENT TRANSIENTS **c93**
N. Shibazaki *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 57-64 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Hard X-ray transient sources are intriguing constituents of X-ray sources. Many hard X-ray transients exhibit recurrent nature. Futhermore, some of them such as 4U0535+26, 4U0538-66 and GX301-2 are known to flare periodically. Models for these recurrent X-ray sources are discussed. Author

N83-15186# Oxford Univ. (England). Dept. of Astrophysics.
THE OPTICAL OUTBURSTS OF THE PERIODIC RECURRENT TRANSIENT A0538-66 **c89**
R. H. Densham, P. A. Charles, J. W. Menzies (South African Astronomical Observatory), J. vanParadijs, and M. vanderKlis *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 65-70 refs Previously announced as A82-19705 Prepared in cooperation with Amsterdam Univ. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Multicolor photometry is presented of the 16.6 day recurrent X-ray transient A0538-66 over four consecutive outbursts in late 1981. There is evidence of considerable activity at least one day prior to maximum, and the magnitudes and colors measured between outbursts are significantly different from previous observations during quiescence, indicating continued activity throughout these cycles. Author

N83-15187# Milan Univ. (Italy). Ist. di Fisica.
A MODEL FOR A0538-66: THE FAST FLARING PULSAR **c89**
L. Maraschi, R. Traversini, and A. Treves *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 71-74 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The conditions for which the onset of the accretion process at periastron in a highly eccentric binary may take place are discussed. The optical flare associated with the X-ray flare is interpreted as reprocessing of X-rays in a envelope surrounding the pulsar. Author

N83-15188*# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
COMPACT X-RAY SOURCES IN THE LARGE MAGELLANIC CLOUD **c93**
Manfred W. Pakull *In its* Accreting Neutron Stars Oct. 1982 p 75-86 refs (For primary document see N83-15179 05-88)
(Contract NAS5-24441)
Avail: NTIS HC A16/MF A01

Sixteen Einstein X-ray sources in the field of the Large Magellanic Cloud (LMC) that appear non-extended in the IPC detector have recently been accurately positioned with the HRI to make optical follow-up studies feasible. At least twelve of these are not associated with the LMC, including one Seyfert galaxy at a redshift of 0.076 and eleven late type galactic foreground stars, some showing photometric behavior typical for RS CVn and BY Dra variables. Two sources are identified with faint blue variable objects, one of them has been observed to exhibit He II 4686 and variable Balmer emission lines being reminiscent of the low mass X-ray binary LMC X-2. The IPC source 1E0501438-7037.6 is probably associated with the LMC OB star Sk-70 36 which has been found to show ellipsoidal light variations with a period of 6.94 d. The results strongly suggest that a gap in the X-ray binary luminosity function of the LMC exists between 10 to the 36th and 10 to the 38th ergls. Author

N83-15189# Institute of Astronomy, Cambridge (England).
THE INFLUENCE OF X-RAYS ON SURROUNDING MATTER **c93**
A. C. Fabian and R. R. Ross (College of the Holy Cross) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 87-93 refs Sponsored in part by the Royal Society (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The general effects of an X-ray source in a stellar wind and evaporated accretion disk coronae in 4U1822-37 and the so called Galactic Bulge sources are considered. The Eddington limit is also briefly discussed. Author

N83-15190# Nagoya Univ. (Japan). Dept. of Astrophysics.
X-RAY BURSTS FROM THE GX17+2 REGION **c93**
S. Hayakawa, T. Hirano, T. Murakami (Inst. of Space and Astronautical Science), F. Nagase, and Y. Tawara *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 94-96 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The positions of three X-ray bursts are obtained with the correlation map method. A nominal error circle for this method has a radius of about 0.5 deg. The error circle of burst A does not contain GX17+2, but a 20 J source 4U1812-12. For bursts B and C the error circles are calculated by simulating these bursts at the proximity of GX17+2. They contain GX17+2 at the confidence level of 90%. Author

N83-15191# Tata Inst. of Fundamental Research, Bombay (India).
WHY ARE MOST X-RAY PULSARS SLOW? **c93**
P. Ghosh and K. M. V. Apparao *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 97-100 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The neutron stars in massive X-ray binaries can be born, it is shown, as slow rotators, because their progenitors can be spun down considerably by the angular momentum loss during the first stage of mass exchange. Author

N83-15192# Leicester Univ. (England). X-ray Astronomy Group.
HER X-1: ARIEL-5 AND ARIEL-6 OBSERVATIONS **c89**
M. J. Ricketts, V. Stanger, and C. G. Page *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 100-105 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Her X-1 was scanned by the Ariel-5 Sky Survey Instrument for a total of 250 days during the period 1974 October to 1980 March, and observed by Ariel-6 for about 10 days in 1981 June. The Ariel-5 flux measurements have a time resolution of 0.07 day and cover the energy range 2 to 15 keV. The Ariel-6 data mainly cover the range 1.5 to 13 keV and have either 0.25 or 0.06 sec resolution and so could be used to measure the pulse period. The 1981 observation spanned the periods MJD 44767.1 to 44774.6 and 44779.9 to 44782.0. Initially in the secondary one, the flux declined over the first two days to the detection limit. When the observation recommenced the turn on had already taken place, and the first feature seen was a pre-eclipse dip, centered on phase, phi sub 1.7 = 0.84. In the sequence in which cycle 0 turn on occurred at MJD 41325.15 these observations extended over cycles 98 and 99. The light curve for this data set is included in figure 2. From the available data, we conclude that the turn on occurred in the interval MJD 44779.0 + or - 1.0. Author

N83-15193# Leicester Univ. (England).
PULSE PHASE SPECTROSCOPY OF 0115+63 AND AN OBSERVATION OF 4U1223-62 **c89**
R. Hall, M. J. Ricketts, and R. Kloss *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 107-111

refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Ariel-6 observed 0115+63 during 1980 December 16-30. The source was in outburst with a mean flux of 150 + or - 20 mCrab, this value is consistant with the HEAO A-2 flux during the previously detected outburst. Throughout the observation there was no evidence for spectral variability on timescales greater than the pulse period. The large Ariel-6 data base has enabled a sensitive study of phase dependent spectral variability. The data were folded over the pulse period (after removal of orbital effects) and subdivided into 16 equal phase bins. As per the phase averaged spectrum the data were best represented by power law + h.e. cut off. The hardening of the pulse profile at pulse maximum is very evident and is similar to the effect observed in GX1+4. A reanalysis of the HEAO A-2 data shows an almost constant spectral index for 0115+63 and in general a tendency for pulsator spectra to harden at minimum is found. This discrepancy is clearly of importance in the modelling of neutron star emission. The variation in the high energy cut off is less significant. J.M.S.

N83-15194# Consiglio Nazionale delle Ricerche, Bologna (Italy). Ist. Tecnologie Studio Radiazioni Extraterrestri.
HARD X-RAY OBSERVATION OF THE TRANSIENT X-RAY PULSAR A0535+26 **c89**
F. Frontera, D. DalFiume, W. Dusi, E. Morelli, G. Spada, and G. Ventura *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 112-116 refs Sponsored in part by the National Center for Atmospheric Research (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The X-ray source A0535+26 is well established as a recurrent transient. During its activity it shows long period pulsations with a relevant and variable rate of decrease of the pulse period. On the basis of its peak luminosity and pulsation features, the source has been suggested as an accreting neutron star in a binary system. In September to October 1980 the source showed a very high level outburst. A flux level in the 1-12 keV energy range. The source was observed in the hard X-ray energy range on October 5th. Due to high signal from A0535+26 the observation resulted to be very effective to study its time variability and energy spectrum. J.M.S.

N83-15195# Consiglio Nazionale delle Ricerche, Frascati (Italy). Ist. di Astrofisica Spaziale.
HARD X-RAY MEASUREMENTS OF A0535+26 DURING LOW STATE **c93**
V. F. Polcaro, A. Bazzano, C. LaPadula, P. Ubertini, G. Vialetto, and R. K. Manchanda (Tata Inst. for Fundamental Research) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 117-120 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

A number of measurements of the recurrent transient X-ray source A0535+26 were made during its outburst phase, since its detection in 1975 by Ariel 5. The optical counterpart of the source (Be Star 245770) was also extensively studied both in active and quiescent state in optical I2R2 and U2V2 bands. These data show a positive correlation with the X-ray flux. The X-ray flux from the source during the outburst increases to about twice the Crab intensity in soft X-ray band and gradually decreases to 100 mCrab during 30 to 50 days. However positive detection of the sources has not been reported until now during the low state. The spectral measurements of the source in the energy band 20-100 keV made during the low state in 1981 are presented. J.M.S.

N83-15196# Consiglio Nazionale delle Ricerche, Frascati (Italy). Ist. di Astrofisica Spaziale.
HARD X-RAY OBSERVATIONS OF THE HER X-1 LINE FEATURE **c89**
R. K. Manchanda (Tata Inst. for Fundamental Research), G. Vialetto, A. Bazzano, C. LaPadula, V. F. Polcaro, and P. Ubertini *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 121-124 refs Spor.sored in part by the Italian Space National Plan (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The X-ray observations Her X-1 include the temporal and energy dependence of spectral features both continuum and line, during the pulse phase, binary phase and the 35 day ON-OFF cycle. The observations of the X-ray intensity and spectral features of the source during mid on 35 is also of considerable interest since it provides further constraints for the geometrical models of the X-ray source. There is no consistent model for the 35 day cyclic variation of the X-ray intensity. Also, little data is available about the variable nature of the emission feature. Two observations separated by a year in 1980 and 1981 were carried out during the mid on phase of Her X-1, by using xenon filled multiwire proportional chambers. The time averaged spectral results of Her X-1 in the 15-150 keV energy range are presented. The possible case of the line centroid variability seen during 1980 experiment is also discussed. J.M.S.

N83-15197# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
PHASE DEPENDENCE OF THE LINE FEATURE IN THE HARD X-RAY SPECTRUM OF HERCULES X-1 **c93**
W. Voges, W. Pietsch, C. Reppin, J. Trumper, E. Kendziorra, and R. Staubert *In its* Accreting Neutron Stars Oct. 1982 p 125-129 refs Prepared in cooperation with Tuebingen Univ. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The hard X-ray spectrum of Hercules X-1 in the energy range 26-120 keV was measured during a 4.4 hr balloon observation on 1977 September 3 with a large phoswich detector system. The spectral feature in the 1.24 s pulsations found in a 1976 observation was detected again and confirmed with large significance. The line feature is either located at 52 keV (as an emission line) or at 38 keV (as an absorption line). An analysis of phase dependent spectra shows a significant variation of the centroid of the cyclotron feature during the main pulse. Implications on some theoretical models are discussed. In a slab model the Doppler broadening of an absorption line in a pencil beam configuration gives good agreement with the observations. Author

N83-15198# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
LINE FEATURES IN THE X-RAY SPECTRUM OF THE CRAB PULSAR **c89**
G. Hasinger, W. Pietsch, C. Reppin, J. Trumper, W. Voges, E. Kendziorra, and R. Staubert *In its* Accreting Neutron Stars Oct. 1982 p 130-133 refs Prepared in cooperation with Tuebingen Univ. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Observation of the Crab pulsar reveal spectral features in the X-ray region that are not quite consistent with the well established theory of a synchrontron origin of the pulsed radar radiation. Evidence was found for a possible emission line at 73 keV with an intensity of *10/cu photons/sq cm/sec from the overall Crab spectrum. Another source of high energy emission due to a hot plasma is suggested. Pulse-phase spectra that show a significant change of the spectral index across the pulse are discussed. Pulse-dependent spectral indexes are compared with those measured by HEAO-1 in the same energy range in a table. The two data sets show the same general behavior, though the amplitude of the variation seems to be higher in the balloon data. J.M.S.

N83-15199# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
HIGHLY NONSTATIONARY ACCRETION ONTO MAGNETIZED NEUTRON STARS **c90**
J. Truemper, G. Morfill, P. Bodenheimer (Calif. Univ., Santa Cruz), and G. Tenorio-Tagle *In its* Accreting Neutron Stars Oct. 1982 p 134-142 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Highly nonstationary accretion onto a magnetized neutron star from a surrounding accretion disc is considered. Nonstationary

accretion has been considered before in terms of droplets or rain or as a necessary consequence of instabilities in the accretion column flow. Here, the extreme of very large units is considered, which by magnetic flow field compression reach the neutron star surface as highly elongated structures, and are termed broomsticks. In this model, these broomsticks are optically thick. Their rate of occurrence has to be sufficiently small so that the column as a whole is optically thin outside the broomstick. Possible consequences of such a model are discussed. J.M.S.

N83-15200# Milan Univ. (Italy). Ist. di Fisica.
TWO TEMPERATURE SPHERICAL ACCRETION ONTO A BLACK HOLE: THE X AND GAMMA RAY SPECTRUM c89
M. Colpi, L. Maraschi, and A. Treves *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 143-145 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The coupled equations for the energy balance of both protons and electrons including cyclosynchrotron were examined. Compton and bremsstrahlung losses for the electrons, inner bremsstrahlung for the protons and the purely collisional energy transfer term between the two are discussed. In a spherically accreting plasma the timescale for collision energy exchange between protons and electrons is often larger than the free fall time scale. More efficient non collisional mechanism of energy exchange in the presence of a turbulent magnetic field justify the class of single temperature models, however, protons and electrons become effectively decoupled. Protons may attain temperatures above the threshold for pion production and produce a considerable gamma ray luminosity due to pi to the third power decay description of the proton inflow have to be considered. E.A.K.

N83-15201# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics.
NON ADIABATIC SELF-CONSISTENT SPHERICAL ACCRETION c90
A. Wandel *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 146-149 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

New solutions for spherical accretion onto a black hole are presented. The solutions are self consistent so that the infalling gas itself emits the radiation which controls its thermal profile. These solutions involve high accretion rates, yielding high luminosities. E.A.K.

N83-15202# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
ACCRETION DISCS AROUND NEUTRON STARS c90
J. E. Pringle (Inst. of Astronomy) *In its* Acceting Neutron Stars Oct. 1982 p 150-154 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Observational evidence for discs in the compact X-ray sources and the evidence disc behavior are discussed and ways theoretical arguments can put limits or cast doubt on some of the empirical models put forward to explain the observations are considered. The disc structure itself is not important as long as it deposits matter on the neutron star at a sufficient rate to produce the X-ray flux. In the outer disc regions, the main disc luminosity comes from absorption and reradiaton of X-ray photons and not from the intrinsic, viscously produced, local energy production rate. It is indicated that in the compact binary X-ray sources confrontation between disc theory and observations is not generally practicable. E.A.K.

N83-15203# Zurich Univ. (Switzerland). Inst. fuer Theoretische Physik.
DISK ACCRETION ONTO WEAKLY MAGNETIZED NEUTRON STARS c90
M. Camenzind *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 156-158 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The physics of the inner accretion disk was studied by low mass X-ray binary systems. It is shown that mass loss from the inner disk explains the X-ray spectrum, X-ray light curve and the fluctuation time scales of the close binary systems Sco X-1, Cyg X-3, 4U 1822-37 and 4U 2129+47. Considerable mass loss always occurs in the more luminous X-ray sources that are close to being Eddington-limited. E.A.K.

N83-15204# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
ON THE COMPATIBILITY OF THERMAL AND HYDROSTATIC EQUILIBRIUM IN THIN RADIATIVE ACCRETION DISKS c90
R. Kippenhahn and H.-C. Thomas *In its* Accreting Neutron Stars Oct. 1982 p 159-160 ref (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

It is shown that in thin disks with an angular velicity distribution according to Kepler's law hydrostatic and thermal equlibria cannot be fulfilled simultaneously. Depending on the amount of viscosity in the disk either thermally or dynamically driven circulation will occur. The velocity of this circulation is kept low because of a slightly baroclinic structure of the disk, which is produced by the circulation currents. E.A.K.

N83-15205# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
OBSERVATIONS OF GAMMA RAY BURSTERS c89
Kevin Hurley *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 161-178 refs Sponsored in part by CNES (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The observational status of gamma ray burst astronomy is reviewed, with emphasis on evidence for a neutron star origin. It is shown that features in burst time histories are compatible with several models involving neutron stars. Burst energy spectra remain difficult to interpret in any self consistent manner, and several observational difficulties exist. The spatial distribution of bursts is not consistent with their log N-log S relation. Counter parts in the X-ray, radio, and optical ranges revealed objects of various types, however coherent picture of burst sources has yet emerged. E.A.K.

N83-15206# Institute of Astronomy, Cambridge (England).
THEORETICAL PROBLEMS RAISED BY GAMMA-RAY BURSTS AND RELATED PHENOMENA c93
Martin J. Rees *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 179-188 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The rapid outbursts observed in X-ray and gamma-ray sources imply a concentrated energy source, allied with an efficient radiation mechanism. The general constraints on rapidly varying cosmic sources and the extreme problems posed by the March 5th 1979 event, if this indeed involves a source as remote as the large Magellanic Cloud (55 kpc distant) are outlined. A class of object which may disgorge a luminosity far exceeding the conventional Eddington limit is also discussed. E.A.K.

N83-15207# California Univ., Santa Cruz. Board of Studies in Astronomy and Astrophysics.
THERMONUCLEAR MODEL FOR HIGH ENERGY TRANSIENTS c93
S. E. Woosley (Lawrence Livermore National Lab.) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 189-208 refs (For primary document see N83-15179 05-88) (Contract W-7405-eng-48; Grant NSF AST-81-08509)
Avail: NTIS HC A16/MF A01

The thermonuclear model for X- and gamma-ray bursts is discussed. Different regimes of nuclear burning are reviewed, each appropriate to a given range of accretion rate. Modifications introduced by radiatively driven mass loss, the thermal inertia of the envelope, different burning mechanisms, and two dimensional

considerations and difficulties encountered when the thermonuclear model is confronted with observations of rapidly recurrent bursts and super Eddington luminosities and temperatures are discussed. Results from a numerical simulation of a combined hydrogen helium runaway initiated at pycnonuclear density are presented. The thermonuclear model for gamma-ray bursts is also reviewed and updated. Gamma-ray bursts of various types appear possible for a very broad variety of accretion rates. The thermonuclear model appears capable of yielding a great diversity of high energy transient phenomena for various accretion rates, magnetic field configurations, and neutron star envelope histories. E.A.K.

N83-15208# Los Alamos Scientific Lab., N. Mex.
X-RAY TRANSIENTS AS SEEN BY VELA, 1969-1979 **c93**
J. Terrell, W. C. Priedhorsky, R. D. Belian, J. P. Conner, and W. D. Evans *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 210-212 refs Sponsored in part by DOE (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The Vela 5B satellite monitored the entire X-ray sky for a period of 10 years, from May 1969 to June 1979. The data were reanalyzed and produced into a series of skymaps. The maps were made into a color movie which shows the changes in the X-ray sky over the period 1969 to 1976. During the lifetime of the X-ray counters, the Vela spacecraft produced data on X-ray transients, X-ray bursts, and gamma ray bursts. the Vela gamma ray detectors revealed the phenomenon of gamma ray bursts. It is found that at least two gamma ray bursts are also detected by the X-ray counters. E.A.K.

N83-15209*# California Univ., San Diego. Center for Astrophysics and Space Science.
AN ABSORPTION FEATURE IN THE SPECTRUM OF A GAMMA RAY BURST ON 25 MARCH 1978 **c93**
Geoffrey J. Hueter and Duane E. Gruber *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 213-215 refs (For primary document see N83-15179 05-88) (Contract NAS8-27974)
Avail: NTIS HC A16/MF A01

The High Energy X-ray and Low Energy Gamma Ray Experiment on HEAO-1 detected a gamma ray burst on March 25, 1978. The main peak of the event lasted 10 seconds, while less intense emission was observed for approximately 100 seconds. The burst spectrum shows an apparent absorption feature at 55 +/- 5 keV with an equivalent width of 13 +/- 3 keV, values commensurate with those reported for bursts recorded by the KONUS experiment. The integrated fluence between 30 keV and 6.1 Mev was 0.000015 ergs/sq cm. The detection syste has localized the burst source to within a degree of RA = 237.2 deg and Dec. = 76.4 deg. M.G.

N83-15210# California Univ., Santa Cruz. Board of Studies in Astronomy and Astrophysics.
RISE TIMES AND DURATIONS OF X-RAY AND GAMMA-RAY BURSTS **c93**
B. A. Fryxell *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 216-218 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Models of neutron star processes to account for observed X-ray and gamma ray burst phenomena are examined. If a sufficiently dense layer of matter is accreted onto the surface of a neutron star, a nuclear runaway can occur at the base of the layer. As a result of the extreme temperature sensitivity of the nuclear reactions, such a runaway will initiate at a single point instead of simultaneously over the entire layer and then propagate around the star as a burning front, igniting the remainder of the accreted fuel. The time required for this front to propagate across the surface can have observational consequences. Depending on the relationhip between this timescale and the time for the emission of energy from the hot matter behind the front, the propagation time can correspond to either the rise time or the duration of the event. Two different types of burning fronts (deflagration or detonation fronts) can be obtained depending on the amount of matter which accumulates before the runaway occurs. M.G.

N83-15211# Los Alamos Scientific Lab., N. Mex.
A 1D THERMONUCLEAR MODEL FOR X-RAY TRANSIENTS **c93**
R. K. Wallace *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 219-222 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The thermonuclear evolution of a 1.41 solar mass neutron star, with a radius of 14.3 km, accreting various mixtures of hydrogen, helium, and heavy elements at rates of 10 to the -11th to 10 to the -10th power solar mass/yr is examined, in conjunction with Woosley and Weaver, using a one-dimensional numerical model. Effects due to general relativity or magnetic fields are ignored. Two cases are discussed. In both models, the accretion rate is such that the hydrogen shell burns to helium in steady state, with the hydrogen burning stabilized by the beta limited CNO cycle. A thick helium shell is produced, which is eventually ignited under extremely degenerate conditions, producing a thermonuclear runaway. M.G.

N83-15212# Consiglio Nazionale delle Ricerche, Frascati (Italy). Ist. di Astrofisica Spaziale.
OBSERVATION OF A VERY WEAK GAMMA RAY BURST **c93**
P. Ubertini, A. Bazzano, R. H. Manchanda (Tata Inst. of Fundamental Research), C. LaPadula, V. F. Polcaro, and G. Vialetto *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 223-228 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The detection of a very faint burst in the hard X-ray range is reported. The burst, having a peak intensity of approximately 7x10 to the -9th power erg/sq cm in the 20 to 120 KeV range, was detected by means of two of the four detectors on board the HXR-81 balloon borne hard X-ray telescope (POKER) during a transmediteranean flight. The spectrum of the burst is given and analyzed to check the presence of emission or absorption features. M.G.

N83-15213# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
OBSERVATION OF COSMIC GAMMA RAY BURSTS WITH THE GAMMA RAY EXPERIMENT ON SMM **c93**
E. Rieger, C. Reppin, G. Kanbach, D. J. Forrest, E. L. Chupp, and G. H. Share (NRL) *In its* Accreting Neutron Stars Oct. 1982 p 229-240 refs Prepared in cooperation with New Hampshire Univ. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The measurements of the March 20, 1982 gamma ray burst obtained by the Solar Maximum Mission satellite are presented. General spectral features, time history, and count rate spectrum of the event are discussed. The burst showed emission to energies higher than 25 MeV. At lower energies (approximately 300 KeV) three separate pulses of a few seconds duration are seen. M.G.

N83-15214*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NEUTRON STARS AS SOURCES OF GAMMA-RAY BURSTS: CONSTRAINTS FROM X-RAY OBSERVATIONS OF SOURCE LOCATIONS **c93**
G. Pizzichini (CNR, Bologna), T. L. Cline, U. D. Desai, B. J. Teegarden, K. Hurley, M. Niel, G. Vedrenne, W. D. Evans, E. E. Fenimore, R. W. Klebesadel et al *In* Max-Planck Inst. of Physics and Astrophysics Accreting Neutron Stars Oct. 1982 p 237-239 refs Prepared in cooperation with Centre d'Etude Spatiale des Rayonnements, Toulouse and with LASL, N. Mex. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Results for three burst locations observed with the imaging proportional counter of the Einstein Observatory are given. The

observations are used to determine temperature and accretion constraints for the burst source. M.G.

N83-15215# Commissariat a l'Energie Atomique, Saclay (France).
THERMONUCLEAR RUNAWAYS AT THE SURFACE OF SLOWLY ACCRETING NEUTRON STARS **c90**
S. Bonazzola (Observatory de Meudon), J. M. Hameury, J. Heyvaerts (Paris Univ. VII), and J. Ventura (Tuebingen Univ.) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 241-243 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Thermonuclear runaways at the surface of neutron stars with mass accretion rates of the order of 10 to the -15th power solar mass/yr/sq km are discussed. This slow accretion results in longer recurrence time scales, of the order of a few years; the shell temperature between two bursts is also lower and consequently the accreted material is pushed to higher densities before the flash. A strong magnetic field causes non-thermal emission during the flash, and may explain the gamma-ray emission. Moreover, it focusses the accretion onto the polar caps. The accretion rate per unit surface may then be 1000 times larger than the rate which result from spherical accretion. The possibility of producing hydrogen-helium flashes in such conditions is investigated. In a previous paper it was found that a metallicity Z = .04 in the accreted layer, thermonuclear instabilities where obtained when the accretion rate was larger than a critical value. However depletion of the C, N, and O nuclei due to gravitational settling seriously affect these results. M.G.

N83-15216# Max-Planck-Institut fuer Extraterrestrische Physik, Garching (West Germany).
ADSORPTION OF GAMMA-RAYS AND THE LOCATION OF THE 5 MARCH 1979 GAMMA-RAY BURST **c93**
A. A. Zdziarski *In its* Accreting Neutron Stars Oct. 1982 p 246-249 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The coordinates of the 5 March, 1979 gamma-ray burst source coincide with those of the supernova remnant N49 in the Large Magellanic Cloud (LMC). The photon energies of the first impulsive phase of the burst extend above 511 KeV, the energy threshold in the center-of-momentum frame for the electron-position pair production by two photons. The rise time of this impulsive phase suggests that the size of the source is smaller than 75 km and requires that the source is smaller than 75 km and requires that the source be a compact object. This size and the 55 kpc distance of the LMC imply the density of photons of an order of magnitude of 1025 photons per cu cm, that is high enough to self-absorb all the gamma-photons in the pair production process. To avoid the attenuation inside the source, the models consisting of an emitting layer of a very small geometrical thickness placed above the neutron star surface were proposed. The optical depth due to the pair absorption of such a layer can be lower than unity, even if the source is in the LMC. However, because of the photon density near the source is still high, the photon absorption occurs above the source as well as inside it. The result of calculations of an optical thickness due to the gamma-gamma pair production process above the isotropically emitting burst source of a neutron star size excludes the thin layer model and suggests that either the emitted gamma-photons were strongly collimated or the burst source is much nearer than the LMC. M.G.

N83-15217# Tuebingen Univ. (West Germany). Lehrstuhl fuer Theoretische Astrophisik.
CAN GAMMA RAY BURSTS ORIGINATE FROM LOW MASS BINARIES? **c93**
Joseph Ventura *In* Max-Planck Inst. Phys. and Astrophy. Accreting Neutron Stars Oct. 1982 p 250-252 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Developments in the evolution of close low mass binaries having a neutron star primary and their possible implication for gamma ray burst models are discussed. M.G.

N83-15218*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
RADIATION FROM THE ACCRETION COLUMN OF MAGNETIZED NEUTRON STARS **c90**
P. Meszaros *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 253-274 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01 CSCL 03B

Some developments in radiative transfer for magnetized neutron star conditions, and their application in models of the structure and properties of self-consistent polar cap emission regions are reviewed. Several of the assumptions and uncertainties involved are discussed, and present problems are indicated. M.G.

N83-15219# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
HEATING OF THE ACCRETING NEUTRON STAR INTERIOR BY THE THERMONUCLEAR BURNING AND THE STEADY CORE TEMPERATURE **c90**
Kenichi Nomoto (Tokyo Univ.) and Sachiko Tsuruta (Montana State Univ.) *In its* Accreting Neutron Stars Oct. 1982 p 275-280 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The thermal history of the accreting neutron star interior prior to the thermonuclear flash is examined. In the models, the accretion forms a steady hydrogen burning shell near the surface from which heat flows into the core. By numerical calculations for the stiff neutron star, it is found: (1) it takes approximately 500,000 for the core to reach the steady state where the heat inflow is balanced with the neutrino loss; and (2) the steady core temperature is approximately 1.1 - 1.2 x 10 to the 8th power K and the neutron star interior is almost isothermal, in particular in the helium layer. Thus the results justify the isothermal approximation for the neutron star interior at the initiation of the helium flash, which is employed in most of the thermonuclear flash models for Type I X-ray bursts. M.G.

N83-15220# Observatoire de Meudon (France).
SEARCH FOR INSTABILITIES IN THE ACCRETION COLUMN OF HER X-1 AND IN THE ACCRETION DISK OF CYG X-1 **c93**
S. Bonazzola *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 282-284 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

A search program to find magnetohydrodynamic instabilities in the accretion column of the Her X-1 pulsar and in the accretion disk of the Cyg x-1 pulsar is discussed. The main results and the physical consequences on the models of the accretion disk are summarized. It was found that the modulation of the emission of the hot spots due to their orbital motion of period P around the black hole has a consequence to introduce in the observed spectrum frequencies higher than the (characteristic time) minus one of the lot spot. If one or more lot spots have an orbital period P, the observed fourier spectrum will show a line at the frequency 1/P with a width equal to the life time of the lot spot. The intermediate spectrum of Cyg X-1 can be interpreted as the superposition of many lot spots orbiting around the black hole with different periods. R.J.F.

N83-15221# Bonn Univ. (West Germany). Inst. fuer Astrophysik.
LATE STAGES OF CLOSE BINARY EVOLUTION: COMMENTS ON ALTERNATIVE SCENARIOS **c89**
W. Kundt *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 285-287 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The following alternatives for the evolution of neutron star binaries are considered. After an initial short-lived pulsar-stage, the neutron star is engulfed by wind plasma from its companion star; or it ejects the impinging plasma in the shape of a narrow beam, like a grindstone. After sufficient spindown, the neutron star turns into an X-ray source whereby Matter is not always stored

in an accretion disk (wind accretion); or an accretion disk exists around all known X-ray pulsars. The inner edge of the accretion disk is located very near the corotation radius; or it is located deep inside the corotation radius. When the second star expands and pushes a significant fraction of its mass towards its neutron star companion, this mass forms a common envelope; or it forms a massive disk around the neutron star. The alternatives are considered with the assumptions that most neutron stars are born in massive binary systems and that neutron stars are fast rotators. R.J.F.

N83-15222# Weizmann Inst. of Science, Rehovoth (Israel).
ON THE MECHANISM OF THERMALIZATION A PLASMA INFALLING ONTO MAGNETIZED NEUTRON STARS c75
R. Z. Yahel *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 289-292 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Preliminary results of deceleration calculations for matter infalling onto a strongly magnetized neutron star are given. The validity of both models of thermalization are given. It was found that for accretion rates approximately greater than 100, 000 gr.cm(-2)sec(-1), stationary, collisionless shock solution do not exist. R.J.F.

N83-15223# Tata Inst. of Fundamental Research, Bombay (India).
PROTON CYCLOTRON EMISSION NEAR ACCRETING MAGNETIC NEUTRON STARS c90
K. M. V. Apparao, S. M. Chitre, and M. J. Rees (Inst. Astronomy) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 293-295 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The process of incoherent proton cyclotron emission occurring near the polar regions of an accreting neutron star is examined with a view to account for the soft X-ray flux observed in Her-X-1 and the possibility of detecting soft X-ray bursts accompanying gamma ray bursts. Author

N83-15224# Tuebingen Univ. (West Germany). Lehrstuhl fuer Theoretische Astrophysik.
ELECTRON-PHOTON INTERACTION IN HOT STRONGLY MAGNETIZED PLASMAS c75
H. Herold *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 296-298 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Results of calculations of electron-photon interaction processes in hot, strongly magnetized plasmas are given. Special emphasis is given to the relativistic effects. It was concluded that relativistic effects are much greater than of the order of B/B sub cr (approximately 0.1), contrary to expectations. Locations and shapes of cyclotron lines depend strongly on the emission angle, which is important for the interpretation of the observed variations of the line features during the pulse period. R.J.F.

N83-15225# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Theoretische Physik.
BOUND-FREE AND FREE-FREE TRANSITIONS IN STRONG MAGNETIC FIELDS c90
G. Wunner *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 299-301 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

As a consequence of the completely altered atomic structure of matter in accreting neutron stars caused by the dominance of strong magnetic fields, the cross sections of all elementary processes are derived anew. R.J.F.

N83-15226# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
TOWARDS MODEL SPECTRA OF ACCRETING MAGNETIC NEUTRON STARS c90
Werner Nagel *In its* Accreting Neutron Stars Oct. 1982 p 302-305 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The problem of computing model spectra of accreting neutron stars is considered. Computing model spectra poses two intricately coupled problems: a magnetohydrodynamical one and the radiative transfer problem. The geometry of the radiation sources and the deceleration mechanism of the accretion flow are investigated. B.W.

N83-15227# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
RADIATIVE TRANSPORT THROUGH AN INHOMOGENEOUS ACCRETION COLUMN c90
K. F. Bickert *In its* Accreting Neutron Stars Oct. 1982 p 306-308 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The transport of X-radiation through the lower few kilometers of the accretion column of a highly magnetized neutron star is simulated using a Monte Carlo photon-transport simulation scheme. The code can take into account the spatial variation of strength and direction of the magnetic field, gravitational redshift and deflection of the photon and its path in the Schwarzschildmetric of a neutronstar with given mass. It can model arbitrary distributions of the parameters of the falling plasma: electron bulkvelocity, density, and temperature. The photonfrequency and wave vector are dopplershifted into the restframes of the accreted plasma, the scattering or absorbing electron, or the distant observer. Author

N83-15228# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
OBSERVATIONAL CAPABILITIES OF EXOSAT AND ROSAT c89
B. Aschenbach *In its* Accreting Neutron Stars Oct. 1982 p 309-313 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

In Europe, the EXOSAT and ROSAT missions will continue the X-ray astronomical research into the 1980's. EXOSAT is almost ready for launch, which will hopefully happen still this year. The launch of ROSAT is scheduled for midth of 1987. Apart from these two approved projects, there are various studies on X-ray astronomy satellites under way. Within ESA, a study of an X-ray timing and spectroscopy mission called X-80 has almost been completed. X-80 is one candidate amongst five for ESA's next scientific project, the selection of which will take place in February 1983. The approved missions, the scientific objections and instrumentation of EXOSAT and ROSAT are described. B.W.

N83-15229# Nagoya Univ. (Japan). Dept. of Astrophysics.
JAPANESE X-RAY ASTRONOMY PROGRAM c89
S. Hayakawa *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 314-315 (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

The status of the Japanese X-ray astronomy program is reviewed. Japanese X-ray astronomy satellite HAKUCHO is still active, although four proportional counters for very soft X-rays ceased to function in August 1980. The second X-ray astronomy satellite ASTRO-B is now under final check-out. The main instrument on board is a set of scintillation proportional counters. The operation of ASTRO-B will be limited by the sun angle smaller than 60 deg from the rear side spin axis. Since the view axes of most detectors are parallel to the front side spin axis, targets to be observed should lie within a circle of radius within 60 deg from the anti-Sun direction. The design of the third X-ray astronomy satellite ASTRO-C has been almost freezed. The main instrument on board is a set of large area proportional counters which will be fabricated in collaboration with the Leicester group. ASTRO-C is a satellite of three-axis control. Its launch is expected in 1987, so that the continuous coverage of X-ray sky will be attainable in 1980's. B.W.

N83-15230*# Illinois Univ., Urbana-Champaign. Dept. of Physics.
OBSERVABLE PROPERTIES OF NEUTRON STARS c89
F. K. Lamb *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 316-332 refs (For primary document see N83-15179 05-88)
(Grants NsG-7653; NSF PHY-80-25605)
Avail: NTIS HC A16/MF A01 CSCL 03C

This paper reviews the information on neutron stars that has been obtained from observations of pulsars and pulsing X-ray stars, with emphasis on results from timing studies. Included are summaries of the most recent theoretical work on neutron star structure and the current evidence concerning neutron star masses and radii. Also included are discussions of large frequency jumps and small-scale timing irregularities, the description of the latter phenomenon in terms of random noise processes, and the use of both as probes of the internal structure and dynamical properties of neutron stars. Finally, some of the most promising directions for future work are briefly noted. Author

N83-15231# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
LIMIT CYCLE INSTABILITIES IN ACCRETION DISKS c90
F. Meyer *In its* Accreting Neutron Stars Oct. 1982 p 333-337 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

Recently, some progress has occurred in the understanding of accretion disk instabilities which are related to a change in the vertical structure of an accretion disk in those parts where partial ionization (mainly of hydrogen) plays a role. In alpha-disks the kinematic viscosity is proportional to the temperature. Therefore together with the latter the inward mass flow velocity caused by viscous diffusion of angular momentum is decreased. In stationary accretion the surface density must then rise in the transition from radiative to convective structure in order to keep the accretion rate constant. Numerical computations show that this rise is so large that the surface density for a convectively structured disk of lower mass accretion rate becomes even larger then that of a radiatively structured disk of higher accretion rate at the same distance from the center. It can easily be shown that stationary accretion then becomes unstable and the disk settles instead into a periodic limit-cycle type of behaviour in which the region in question alternates between a longer phase of cool convective structure with a locally small accretion rate and a shorter phase of hot radiative structure with a locally high mass accretion rate. B.W.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N83-15232 California Univ., Santa Cruz.
AN OBSERVATIONAL STUDY OF THE NARROW-LINE REGION OF INTERMEDIATE SEYFERT GALAXIES Ph.D. Thesis
Ross David Cohen 1981 117 p
Avail: Univ. Microfilms Order No. DA8223394

A study of the optical spectra of a group of intermediate Seyfert galaxies was done to determine the relationship of intermediate Seyfert galaxies to Seyfert 1 and Seyfert 2 galaxies. Intermediate Seyfert galaxies, or Seyfert 1.5 galaxies, have permitted-line profiles which are composites of broad and narrow line profiles. The optical spectra of 14 intermediate Seyfert galaxies were obtained with the image-tube, image dissector scanner on the 3-m Shane telescope of the Lick Observatory. The properties of the narrow lines including line ratios and profiles, were compared with the properties of Seyfert 2 galaxies. The broad-line properties were compared with those of Seyfert 1 galaxies. The broad-line spectra of intermediate Seyfert galaxies are similar to those of Seyfert 1 galaxies, and the narrow-line spectra are like those of Seyfert 2 galaxies. Some of the galaxies do have considerably stronger high-ionization lines than do Seyfert 2 galaxies, however, and there are indications that the temperature is higher in the narrow-line region of intermediate Seyfert galaxies than it is in the Seyfert 2 galaxies. Dissert. Abstr.

N83-15233*# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
MOLECULAR EMISSION BANDS IN THE ULTRAVIOLET SPECTRUM OF THE RED RECTANGLE STAR HD 44179
Michael L. Sitko [1981] 21 p refs
(NASA-CR-169613; NAS 1.26:169613) Avail: NTIS HC A02/MF A01 CSCL 03A

New observations of the ultraviolet spectrum of HD 44179 are reported. Absorption due to the CO molecule is present in the spectrum with NCO approximately 10 to the 18th power per sq cm. Emission due to either CO or a molecle containing C=C, C=N, C-C, and C-H bonds (or both) is also present. Author

N83-15234*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STELLAR CONTRIBUTIONS TO THE HARD X-RAY GALACTIC RIDGE
S. M. Worrall and F. E. Marshall Oct. 1982 24 p refs Submitted for publication
(NASA-TM-84932; Rept-661; NAS 1.15:84932) Avail: NTIS HC A02/MF A01 CSCL 03A

The number density of serendipitous sources in galactic plane Einstein Observatory IPC fields are compared with predictions based on the intensity of the HEAO-1 A2 unresolved hrd X-ray galactic ridge emission. It is concluded that theoretically predicted X-ray source populations of luminosity 8 x 10 to the 32nd power to 3 x 10 to the 34th power ergs s have 2 KeV to 10 KeV local surface densities of less than approximately .0008 L(32) pc/2 and are unlikely to be the dominant contributors to the hard X-ray ridge. An estimate for Be/neutron star binary systems, such as X Persei, gives a 2 keV to 10 keV local surface density of approximately 26 x 10 to the -5 power L(32) pc/2. Stellar systems of low luminosity, are more likely contributors. Both RS CVn and cataclysmic variable systems contribute 43% + or - 18% of the ridge. A more sensitive measurement of the ridge's hard X-ray spectrum should reveal Fe-line emission. We speculate that dM stars are further major contributors. A.R.H.

N83-15235*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A 2 COMPONENT X-RAY SPECTRUM FROM SMC X-1
F. E. Marshall, N. E. White, and R. H. Becker Sep. 1982 24 p refs Submitted for publication
(NASA-TM-84002; Rept-661; NAS 1.15:84002) Avail: NTIS HC A02/MF A01 CSCL 03A

Both HEAO-1 A2 and Einstein SSS observations of SMC X-1 are presented. An unpulsed soft component is found with a blackbody temperature of 0.16 keV and an area for the emission region of 10 to the 15th power sq cm to 10 to the 17th power sq cm. The hard X-ray component is pulsed; the phase averaged spectrum is a power law with alpha approximately 0.5 keV up to 17 keV above which it steepens. The SSS sets an upper limit of $< 4 \times 10$ to the 21st power H cm/2 to any absorption and is consistent with that expected from the wind of SK160. Absorption dips with a timescale of several hundred seconds are seen immediately following an eclipse exit and are probably caused by inhomogeneities in the wind of SK160. Author

N83-15236# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RADIO-ASTRONOMICAL INSTRUMENTS OBSERVATIONS, SELECTED ARTICLES
2 Aug. 1982 271 p refs Transl. into ENGLISH from Tr. Fiz. Inst. im. P. N. Lebedeva, Radioastron. Instrumenty in Nablyudeniya (USSR), v. 47, 1969 p 25-84, 117-136, 149-162, 173-182, 201-211
(AD-A118963; FTD-ID(RS)T-0564-82) Avail: NTIS HC A13/MF A01 CSCL 03/1

Radio astronomic methods used in astrophysics were studied. These methods make it possible to record the radiation of space objects over a wide range of radio waves and to assess their physical properties. In most cases the intrinsic emission of radio sources is small, which puts heavy demands on the sensitivity of radiotelescopes. The minimally detected flow density agrees with radiotelescopic parameters. The radiometer with the quantum paramagnetic traveling wave amplifier of 8 centimeter range was developed. The radiometer and the first observation results are described. E.A.K.

N83-15180# Oxford Univ. (England). Dept. of Astrophysics.
OPTICAL OBSERVATIONS OF BINARY X-RAY SOURCES
Philip A. Charles *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 1-13 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15182*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE OBSERVED PROPERTIES OF X-RAY PULSARS
N. E. White *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 29-40 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01 CSCL 03A

N83-15183*# California Univ., San Diego. Center for Astrophysics and Space Science.
HARD X-RAY OBSERVATIONS OF FAST PULSARS FROM HEAO-1
Duane E. Gruber and Francis A. Primini (MIT) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 41-52 refs (For primary document see N83-15179 05-88) (Contracts NAS8-27974; NAS8-27975)
Avail: NTIS HC A16/MF A01 CSCL 03C

N83-15184# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
GX 301-2: THE 41.5 DAY PERIOD AND ITS OPTICAL COUNTERPART
Manfred W. Pakull *In its* Accreting Neutron Stars Oct. 1982 p 53-56 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15186# Oxford Univ. (England). Dept. of Astrophysics.
THE OPTICAL OUTBURSTS OF THE PERIODIC RECURRENT TRANSIENT A0538-66
R. H. Densham, P. A. Charles, J. W. Menzies (South African Astronomical Observatory), J. vanParadijs, and M. vanderKlis *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 65-70 refs Previously announced as A82-19705 Prepared in cooperation with Amsterdam Univ. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15187# Milan Univ. (Italy). Ist. di Fisica.
A MODEL FOR A0538-66: THE FAST FLARING PULSAR
L. Maraschi, R. Traversini, and A. Treves *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 71-74 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15192# Leicester Univ. (England). X-ray Astronomy Group.
HER X-1: ARIEL-5 AND ARIEL-6 OBSERVATIONS
M. J. Ricketts, V. Stanger, and C. G. Page *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 100-105 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15193# Leicester Univ. (England).
PULSE PHASE SPECTROSCOPY OF 0115+63 AND AN OBSERVATION OF 4U1223-62
R. Hall, M. J. Ricketts, and R. Kloss *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 107-111 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15194# Consiglio Nazionale delle Ricerche, Bologna (Italy). Ist. Tecnologie Studio Radiazioni Extraterrestri.
HARD X-RAY OBSERVATION OF THE TRANSIENT X-RAY PULSAR A0535+26
F. Frontera, D. DalFiume, W. Dusi, E. Morelli, G. Spada, and G. Ventura *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 112-116 refs Sponsored in part by the National Center for Atmospheric Research (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15196# Consiglio Nazionale delle Ricerche, Frascati (Italy). Ist. di Astrofisica Spaziale.
HARD X-RAY OBSERVATIONS OF THE HER X-1 LINE FEATURE
R. K. Manchanda (Tata Inst. for Fundamental Research), G. Vialetto, A. Bazzano, C. LaPadula, V. F. Polcaro, and P. Ubertini *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 121-124 refs Sponsored in part by the Italian Space National Plan (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15198# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
LINE FEATURES IN THE X-RAY SPECTRUM OF THE CRAB PULSAR
G. Hasinger, W. Pietsch, C. Reppin, J. Trumper, W. Voges, E. Kendziorra, and R. Staubert *In its* Accreting Neutron Stars Oct. 1982 p 130-133 refs Prepared in cooperation with Tuebingen Univ. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15200# Milan Univ. (Italy). Ist. di Fisica.
TWO TEMPERATURE SPHERICAL ACCRETION ONTO A BLACK HOLE: THE X AND GAMMA RAY SPECTRUM
M. Colpi, L. Maraschi, and A. Treves *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 143-145 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15205# Centre d'Etude Spatiale des Rayonnements, Toulouse (France). Centre d'Etude Spatiale des Rayonnements.
OBSERVATIONS OF GAMMA RAY BURSTERS
Kevin Hurley *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 161-178 refs Sponsored in part by CNES (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15221# Bonn Univ. (West Germany). Inst. fuer Astrophysik.
LATE STAGES OF CLOSE BINARY EVOLUTION: COMMENTS ON ALTERNATIVE SCENARIOS
W. Kundt *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 285-287 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15228# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
OBSERVATIONAL CAPABILITIES OF EXOSAT AND ROSAT
B. Aschenbach *In its* Accreting Neutron Stars Oct. 1982 p 309-313 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15229# Nagoya Univ. (Japan). Dept. of Astrophysics.
JAPANESE X-RAY ASTRONOMY PROGRAM
S. Hayakawa *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 314-315 (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15230*# Illinois Univ., Urbana-Champaign. Dept. of Physics.
OBSERVABLE PROPERTIES OF NEUTRON STARS
F. K. Lamb *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 316-332 refs (For primary document see N83-15179 05-88)
(Grants NsG-7653; NSF PHY-80-25605)
Avail: NTIS HC A16/MF A01 CSCL 03C

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N83-15237 California Univ., Berkeley.
THE DENSITY DISTRIBUTION AND LUMINOSITY FUNCTION OF FAINT STARS IN THE GALAXY Ph.D. Thesis
Kate Oliver Brooks 1981 248 p
Avail: Univ. Microfilms Order No. DA8212061

Three models of the Galaxy are proposed. The method of analysis is to use the equation of stellar statistics to synthesize color-magnitude distributions under simple assumptions about the density and luminosity-color functions and number of populations in the Galaxy. A major source of uncertainty in the models is found to be the covariance between the level of local density (i.e., the luminosity function) and the density gradient away from the Sun (since few local stars are seen in small fields at faint magnitudes). Dissert. Abstr.

N83-15238 Harvard Univ., Cambridge, Mass.
TOPICS IN THE PHYSICS OF INTERSTELLAR CLOUDS Ph.D. Thesis
Wayne Giles Roberge 1981 261 p
Avail: Univ. Microfilms Order No. DA8223420

Physical and chemical processes in interstellar clouds are discussed in six papers. The topics include collision-induced dissociation of H2 and CO molecules; the penetration of diffuse ultraviolet radiation into instellar clouds; photoionization and photodissociation in diffuse interstellar clouds; the calculation of steady state models of diffuse interstallar clouds; cooling by C(+) ions in instellar clouds; and the formation and destruction of HeH(+) in astrophysical plasmas. Dissert. Abstr.

N83-15239# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.
INDICATIONS OF A GENERAL ANISOTROPY OF THE UNIVERSE
H. H. Fliche, J. M. Souriau, and R. Triay Mar. 1981 8 p refs (DE81-700190; CNRS-CPT-81-P-1283) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Quite diverse observations of quasars, galaxies, blackbody radiation, made in most regions of the sky indicate a possibility of general stratification in all of the universe, geometrically and kinematically. DOE

N83-15240# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
THE BERKELEY AUTOMATED SUPERNOVA SEARCH
Jordin T. Kare, Carlton R. Pennypacker, Richard A. Muller, Terry S. Mast, Frank S. Crawford, and M. Shane Burns Jun. 1981 17 p refs Presented at the NATO Advan. Study Inst. on Supernova, Cambridge, 28 Jun. - 10 Jul. 1981
(Contract W-7405-eng-48)
(DE82-001341; LBL-13317; CONF-8106163-2) Avail: NTIS HC A02/MF A01

The automated supernova search employs a computer controlled 36-inch telescope and charge coupled device (CCD) detector to image 2500 galaxies per night. A minicomputer compares each galaxy image with stored reference data to identify supernovae in real time. It is planned to monitor roughly 500 galaxies in Virgo and closer every night, and an additional 6000 galaxies out to 70 Mpc on a three night cycle. This should yield very early detection of several supernovae per year for detailed study, and reliable premaximum detection of roughly 100 supernovae per year for statistical studies. GRA

N83-15181# Nagoya Univ. (Japan). Dept. of Astrophysics.
VARIATIONS OF PULSE PERIODS OF X-RAY PULSARS
S. Hayakawa and F. Nagase *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 14-28 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15199# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
HIGHLY NONSTATIONARY ACCRETION ONTO MAGNETIZED NEUTRON STARS
J. Truemper, G. Morfill, P. Bodenheimer (Calif. Univ., Santa Cruz), and G. Tenorio-Tagle *In its* Accreting Neutron Stars Oct. 1982 p 134-142 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15201# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Nuclear Physics.
NON ADIABATIC SELF-CONSISTENT SPHERICAL ACCRETION
A. Wandel *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 146-149 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15202# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
ACCRETION DISCS AROUND NEUTRON STARS
J. E. Pringle (Inst. of Astronomy) *In its* Accteting Neutron Stars Oct. 1982 p 150-154 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15203# Zurich Univ. (Switzerland). Inst. fuer Theoretische Physik.
DISK ACCRETION ONTO WEAKLY MAGNETIZED NEUTRON STARS
M. Camenzind *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 156-158 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15204# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
ON THE COMPATIBILITY OF THERMAL AND HYDROSTATIC EQUILIBRIUM IN THIN RADIATIVE ACCRETION DISKS
R. Kippenhahn and H.-C. Thomas *In its* Accreting Neutron Stars Oct. 1982 p 159-160 ref (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15215# Commissariat a l'Energie Atomique, Saclay (France).
THERMONUCLEAR RUNAWAYS AT THE SURFACE OF SLOWLY ACCRETING NEUTRON STARS
S. Bonazzola (Observatory de Meudon), J. M. Hameury, J. Heyvaerts (Paris Univ. VII), and J. Ventura (Tuebingen Univ.) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 241-243 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15218*# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
RADIATION FROM THE ACCRETION COLUMN OF MAGNETIZED NEUTRON STARS
P. Meszaros *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 253-274 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01 CSCL 03B

N83-15219# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
HEATING OF THE ACCRETING NEUTRON STAR INTERIOR BY THE THERMONUCLEAR BURNING AND THE STEADY CORE TEMPERATURE
Kenichi Nomoto (Tokyo Univ.) and Sachiko Tsuruta (Montana State Univ.) *In its* Accreting Neutron Stars Oct. 1982 p 275-280 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15223# Tata Inst. of Fundamental Research, Bombay (India).
PROTON CYCLOTRON EMISSION NEAR ACCRETING MAGNETIC NEUTRON STARS
K. M. V. Apparao, S. M. Chitre, and M. J. Rees (Inst. Astronomy) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 293-295 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15225# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Theoretische Physik.
BOUND-FREE AND FREE-FREE TRANSITIONS IN STRONG MAGNETIC FIELDS
G. Wunner *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 299-301 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15226# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
TOWARDS MODEL SPECTRA OF ACCRETING MAGNETIC NEUTRON STARS
Werner Nagel *In its* Accreting Neutron Stars Oct. 1982 p 302-305 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15227# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
RADIATIVE TRANSPORT THROUGH AN INHOMOGENEOUS ACCRETION COLUMN
K. F. Bickert *In its* Accreting Neutron Stars Oct. 1982 p 306-308 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15231# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). . Inst. fuer Astrophysik.
LIMIT CYCLE INSTABILITIES IN ACCRETION DISKS
F. Meyer *In its* Accreting Neutron Stars Oct. 1982 p 333-337 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N83-15241 California Inst. of Tech., Pasadena.
THE COMPOSITION, VERTICAL STRUCTURE AND GLOBAL VARIABILITY OF THE LOWER CLOUD DECK ON VENUS AS DETERMINED BY RADIO OCCULTATION TECHNIQUES Ph.D. Thesis
Josephine Beatrice Ciming 1982 293 p
Avail: Univ. Microfilms Order No. DA8219900

The opportunity to determine the planetwide temperature and cloud structure of Venus using radio occultation techniques arose with Pioneer Venus. Amplitude and Doppler data provided by the radio occultation experiment offered a unique and powerful means of examining the atmospheric properties in the lower cloud region. Absorption due to gaseous components of the atmosphere were subtrated from the measured adsorption coefficient profiles before they were used to compute cloud mass contents. This absorption was found to represent a small part of the total absorption, depending on the latitude. The mass contents for all orbits in the equatorial region of Venus were calculated. Mass content profiles were determined for occultations in the polar, collar, midlatitudinal and equatorial regions. Dissert. Abstr.

N83-15242 California Univ., Los Angeles.
MODELS OF PLANETARY-SCALE WAVES IN THE VENUS ATMOSPHERE Ph.D. Thesis
Curtis Charles Covey 1982 242 p
Avail: Univ. Microfilms Order No. DA8219664

Two models of wave propagation which predict oscillations with the observed properties. The models incorporate the monotonic variation of atmospheric rotation from nearly zero at the planetary surface to the 4 day rotation at the cloud tops. Wind shear precludes separability of the wave propagation equation, in contrast to the simpler terrestrial problem. The problem is solved by expanding in spherical harmonics (the spherical model) or by simplifying the latitude dependence (the beta plane model). Preferred modes of oscillation are found by imposing forcing over a wide range of frequencies and looking for those frequencies at which the atmospheric response is greatly enhanced. Results reveal two types of planetary scale waves which explain the observations upward propagating gravity waves, which travel slightly faster than the 4 day rotation, and upward propagating Rossby waves, which travel slightly slower. Dissert. Abstr.

N83-15243*# Texas A&M Univ., College Station. Dept. of Physics.
RADIATIVE TRANSFER IN REALISTIC PLANETARY ATMOSPHERES Final Report
Gilbert N. Plass and George W. Kattawar 1 Oct. 1982 12 p
(Grant NGR-44-001-117)
(NASA-CR-169673; NAS 1.26:169673) Avail: NTIS HC A02/MF A01 CSCL 03B

Some 40 publications that appeared in scientific journals from 1973 to 1981 as well as 45 scientific reports issued during the grant period are listed by title. Topics cover the development of a matrix operator theory of adiative transfer which made possible the exact model calculations of the radiance as a function of height in planetary atmospheres; calculation of the Mie phase matrix for various types of particles as well as for radiance and polarization in planetary atmospheres; analysis of high dispersion spectroscopic observations of Venus; calculation of curves of growth for Venus; the development of a theory for calculating radiative transfer in spherical shell atmospheres; investigations of zonal winds on Venus; and examination of Rayleigh scattering. A.R.H.

N83-15244*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MOLECULAR PROCESSES IN COMETS Semiannual Progress Report, 1 Jul. - 31 Dec. 1982
A. Dalgarno Dec. 1982 51 p refs
(Grant NsG-7421)
(NASA-CR-169713; NAS 1.26:169713; SAPR-10) Avail: NTIS HC A04/MF A01 CSCL 03B

Potential energy curves for the two lowest 2 sigma- states of OH are computed at the configuration-interaction level using four different basis sets. Electronic transition dipole moments connecting the excited 1 2 sigma- and 2(D) 2 sigma- states with each other and with he ground X2pi state are presented as functions of internuclear distance. The theoretical absorption oscillator strengths for the D 2 sigma-(v prime=0) reverser to X 2pi (v prime prime=0) transition are in good agreement with the empirical value derived from astronomical measurements. The photodissociation cross sections for absorption rom the v prime prime=0,1, and levels of the ground state into the continuum of the 1 2 sigma- state are calculated, and the interstellar and cometary photodissociation rates are derived. Author

N83-15245*# National Aeronautics and Space Administration, Washington, D. C.
THE LUNAR FEATURES OF MERCURY
G. A. Burba Jun. 1976 17 p refs Transl. into ENGLISH from Lunnyye Cherty Merkuriya (Priroda), no. 3, Mar. 1976 p 77-89 Transl. by Agnew Tech-Tran, Inc., Woodland Hills, Calif. Original doc. prep. by USSR Academy of Sci.
(Contract NASw-2789)
(NASA-TT-F-17041) Avail: NTIS HC A02/MF A01 CSCL 03B

Phototelemetry on Mercury, obtained by means of the Mariner-10 space probe, made it possible to study the planet's geologic history. The fact that its mean density is the same as the Earth's (5.5 g/cu cm3), and that its size is small (the diameter of Mercury is 4880 km--i.e., more than one-third that of the Earth) had resulted in the initial presumption of a unique history in the development of Mercury's surface. Instead, a striking similarity to the Moon's surface was discovered. The Mariner-10 research made it possible to study optical properties of the surface, craters and circular basins, plains and specific relief features of Mercury. It was established that there are large circular basins and craters on the Moon, Mars, and Mercury; this indicates the uniformity relief formation processes. An asymmetry is observed in the distribution of the basic surface subdivisions--heavily cratered areas and plains. This peculiarity is accepted as a common formation feature for Earth Group planets. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N83-15246# Stanford Univ., Calif. Inst. for Plasma Research.
OBSERVATION OF ADDITIONAL LOW-DEGREE FIVE-MINUTE MODES OF SOLAR OSCILLATION
Philip H. Scherrer, John M. Wilcox, Jorgen Christensen-Dalsgaard, and Douglas Gough Apr. 1982 16 p refs
(Contract N00014-76-C-0207)
(AD-A118805; SU-IPR-922) Avail: NTIS HC A02/MF A01 CSCL 30/2

By measuring the difference between the shifts in the Fe 5124 spectrum line from light integrated from a central circular portion of the solar disk and from an annular portion exterior to it, we have been able to detect high-order solar osillations with degrees 1 = 3, 4 and 5. The frequencies of the octupole modes agree well with the values obtained from whole-disk measurements at the South Pole. A least-squares fit of the observed frequencies to values interpolated between and extrapolated from the predictions of a sequence of solar models with diferent chemical compositions selects a model with a helium abundance somewhat greater than 25 percent by mass. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N83-15247# Bhabha Atomic Research Centre, Bombay (India).
SKYSHINE SPECTRA OF GAMMA RAYS
J. Swarup 1980 71 p refs
(BARC-1064) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

A study of the spectra of gamma photons back-scattered in vertical direction by infinite air above ground (skyshine) is presented. The source for these measurements is a 650 Ci Cobalt-60 point-source and the skyshine spectra are reported for distances from 150 m to 325 m from the source, measured with a 5 cm NaI(T1) detector collimated with collimators of 12 mm and 20 mm diameter and 5 cm length. These continuous spectra are unfolded with Gold's iterative technique. The photon-spectra so obtained have a distinct line at 72 keV due to multiply-scattered photons. This is an energy where photoelectric and Compton cross-sections for multiply-scattered photons balance each other. DOE

N83-15185# Institute of Space and Astronautical Science, Tokyo (Japan).
HARD X-RAY RECURRENT TRANSIENTS
N. Shibazaki *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 57-64 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15188*# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany). Inst. fuer Extraterrestrische Physik.
COMPACT X-RAY SOURCES IN THE LARGE MAGELLANIC CLOUD
Manfred W. Pakull *In its* Accreting Neutron Stars Oct. 1982 p 75-86 refs (For primary document see N83-15179 05-88)
(Contract NAS5-24441)
Avail: NTIS HC A16/MF A01

N83-15189# Institute of Astronomy, Cambridge (England).
THE INFLUENCE OF X-RAYS ON SURROUNDING MATTER
A. C. Fabian and R. R. Ross (College of the Holy Cross) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 87-93 refs Sponsored in part by the Royal Society (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15190# Nagoya Univ. (Japan). Dept. of Astrophysics.
X-RAY BURSTS FROM THE GX17+2 REGION
S. Hayakawa, T. Hirano, T. Murakami (Inst. of Space and Astronautical Science), F. Nagase, and Y. Tawara *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 94-96 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15191# Tata Inst. of Fundamental Research, Bombay (India).
WHY ARE MOST X-RAY PULSARS SLOW?
P. Ghosh and K. M. V. Apparao *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 97-100 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15195# Consiglio Nazionale delle Ricerche, Frascati (Italy). Ist. di Astrofisica Spaziale.
HARD X-RAY MEASUREMENTS OF A0535+26 DURING LOW STATE
V. F. Polcaro, A. Bazzano, C. LaPadula, P. Ubertini, G. Vialetto, and R. K. Manchanda (Tata Inst. for Fundamental Research) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 117-120 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15197# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
PHASE DEPENDENCE OF THE LINE FEATURE IN THE HARD X-RAY SPECTRUM OF HERCULES X-1
W. Voges, W. Pietsch, C. Reppin, J. Trumper, E. Kendziorra, and R. Staubert *In its* Accreting Neutron Stars Oct. 1982 p 125-129 refs Prepared in cooperation with Tuebingen Univ. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15206# Institute of Astronomy, Cambridge (England).
THEORETICAL PROBLEMS RAISED BY GAMMA-RAY BURSTS AND RELATED PHENOMENA
Martin J. Rees *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 179-188 refs (For primary document

see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15207# California Univ., Santa Cruz. Board of Studies in Astronomy and Astrophysics.
THERMONUCLEAR MODEL FOR HIGH ENERGY TRANSIENTS
S. E. Woosley (Lawrence Livermore National Lab.) *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 189-208 refs (For primary document see N83-15179 05-88) (Contract W-7405-eng-48; Grant NSF AST-81-08509)
Avail: NTIS HC A16/MF A01

N83-15208# Los Alamos Scientific Lab., N. Mex.
X-RAY TRANSIENTS AS SEEN BY VELA, 1969-1979
J. Terrell, W. C. Priedhorsky, R. D. Belian, J. P. Conner, and W. D. Evans *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 210-212 refs Sponsored in part by DOE (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15209*# California Univ., San Diego. Center for Astrophysics and Space Science.
AN ABSORPTION FEATURE IN THE SPECTRUM OF A GAMMA RAY BURST ON 25 MARCH 1978
Geoffrey J. Hueter and Duane E. Gruber *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 213-215 refs (For primary document see N83-15179 05-88) (Contract NAS8-27974)
Avail: NTIS HC A16/MF A01

N83-15210# California Univ., Santa Cruz. Board of Studies in Astronomy and Astrophysics.
RISE TIMES AND DURATIONS OF X-RAY AND GAMMA-RAY BURSTS
B. A. Fryxell *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 216-218 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15211# Los Alamos Scientific Lab., N. Mex.
A 1D THERMONUCLEAR MODEL FOR X-RAY TRANSIENTS
R. K. Wallace *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 219-222 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15212# Consiglio Nazionale delle Ricerche, Frascati (Italy). Ist. di Astrofisica Spaziale.
OBSERVATION OF A VERY WEAK GAMMA RAY BURST
P. Ubertini, A. Bazzano, R. H. Manchanda (Tata Inst. of Fundamental Research), C. LaPadula, V. F. Polcaro, and G. Vialetto *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 223-228 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15213# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
OBSERVATION OF COSMIC GAMMA RAY BURSTS WITH THE GAMMA RAY EXPERIMENT ON SMM
E. Rieger, C. Reppin, G. Kanbach, D. J. Forrest, E. L. Chupp, and G. H. Share (NRL) *In its* Accreting Neutron Stars Oct. 1982 p 229-240 refs Prepared in cooperation with New Hampshire Univ. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15214*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NEUTRON STARS AS SOURCES OF GAMMA-RAY BURSTS: CONSTRAINTS FROM X-RAY OBSERVATIONS OF SOURCE LOCATIONS
G. Pizzichini (CNR, Bologna), T. L. Cline, U. D. Desai, B. J. Teegarden, K. Hurley, M. Niel, G. Vedrenne, W. D. Evans, E. E. Fenimore, R. W. Klebesadel et al *In* Max-Planck Inst. of Physics and Astrophysics Accreting Neutron Stars Oct. 1982 p 237-239 refs Prepared in cooperation with Centre d'Etude Spatiale des Rayonnements, Toulouse and with LASL, N. Mex. (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15216# Max-Planck-Institut fuer Extraterrestrische Physik, Garching (West Germany).
ADSORPTION OF GAMMA-RAYS AND THE LOCATION OF THE 5 MARCH 1979 GAMMA-RAY BURST
A. A. Zdziarski *In its* Accreting Neutron Stars Oct. 1982 p 246-249 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

N83-15217# Tuebingen Univ. (West Germany). Lehrstuhl fuer Theoretische Astrophisik.
CAN GAMMA RAY BURSTS ORIGINATE FROM LOW MASS BINARIES?
Joseph Ventura *In* Max-Planck Inst. Phys. and Astrophy. Accreting Neutron Stars Oct. 1982 p 250-252 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

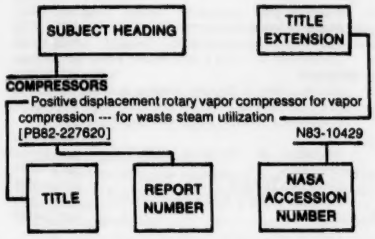
N83-15220# Observatoire de Meudon (France).
SEARCH FOR INSTABILITIES IN THE ACCRETION COLUMN OF HER X-1 AND IN THE ACCRETION DISK OF CYG X-1
S. Bonazzola *In* Max-Planck Inst. Phys. and Astrophys. Accreting Neutron Stars Oct. 1982 p 282-284 refs (For primary document see N83-15179 05-88)
Avail: NTIS HC A16/MF A01

99 GENERAL

N83-15248*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESEARCH AND TECHNOLOGY REPORT OF THE LANGLEY RESEARCH CENTER Annual Report
1982 91 p
(NASA-TM-84570; NAS 1.15:84570) Avail: NTIS HC A05/MF A01 CSCL 05B

Highlights of major accomplishments and applications made during the past year at the Langley Research Center are reported. The activities and the contributions of this work toward maintaining United States leadership in aeronautics and space research are also discussed. Accomplishments in the fields of aeronautics and space technology, space science and applications and space transportation systems are discussed. E.A.K.

Typical Subject Index Listing



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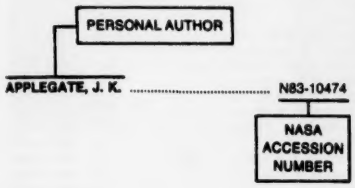

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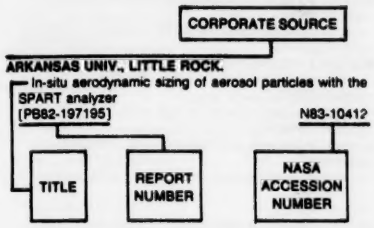

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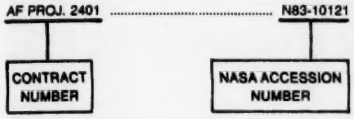

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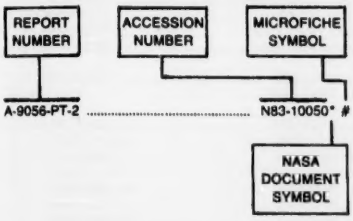

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AD-A119787 ..... N83-14773 #
AD-A119788 ..... N83-14062 #
AD-A119793 ..... N83-15156 #
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AD-A119801 ..... N83-14979 #
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AD-A119804 ..... N83-14448 #
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AD-A119813 ..... N83-15029 #
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AD-A119815 ..... N83-15030 #
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AD-F300073 ..... N83-14193 #
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AERE-R-10418 ..... N83-14502 #

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AFESC/ESL-TR-81-58 ..... N83-14495 #
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AFOSR-82-0648TR ..... N83-15012 #
AFOSR-82-0665TR ..... N83-14991 #
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AFOSR-82-0719TR ..... N83-14997 #
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AFWAL-TR-82-2054 ..... N83-14151 #
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AGARD-R-702 ..... N83-14065 #
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AMMRC-TR-82-23 ..... N83-14258 #
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ARL-AERO-NOTE-406 ..... N83-14106 #

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ARO-13169.4-MS ..... N83-14188 #
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ARO-15804.5-MS ..... N83-14188 #
ARO-15893.2-LS ..... N83-14190 #
ARO-15979.4-MS ..... N83-14257 #
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ARO-16448.2-MS ..... N83-14282 #
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ARO-18072.1-MA ..... N83-14999 #
ARO-18072.2-MA ..... N83-15028 #
ARO-18072.3-MA ..... N83-15024 #
ARO-18072.4-MA ..... N83-15021 #
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ARSL-TR-81-2 ..... N83-14570* #

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B-199008 ..... N83-14951 #

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B-204622 ..... N83-14770 #
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B-205335 ..... N83-14147 #
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BARC-1064 ..... N83-15247 #
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BLL-M-26673-(5828.4) ..... N83-14212 #
BLL-M-26674-(5828.4) ..... N83-14217 #
BLL-M-26680-(5828.4) ..... N83-14229 #
BLL-M-26681-(5828.4) ..... N83-14228 #
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BLL-M-26684-(5828.4) ..... N83-14225 #
BLL-M-26690-(5828.4) ..... N83-14224 #
BLL-M-26691-(5828.4) ..... N83-14235 #
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BLL-M-26696-(5828.4) ..... N83-14214 #
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BLL-M-26707-(5828.4) ..... N83-14221 #
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BLL-M-26720-(5828.4) ..... N83-14220 #
BLL-M-26735-(5828.4) ..... N83-14238 #
BLL-M-26742-(5828.4) ..... N83-14219 #
BLL-M-26750-(5828.4) ..... N83-14236 #
BLL-M-26751-(5828.4) ..... N83-14239 #
BLL-M-26752-(5828.4) ..... N83-14240 #
BLL-M-26753-(5828.4) ..... N83-14218 #
BLL-M-26760-(5828.4) ..... N83-14216 #
BLL-M-26761-(5828.4) ..... N83-14213 #
BLL-M-26764-(5828.4) ..... N83-14231 #
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BMFT-FB-T-82-123 ..... N83-14783 #
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BMFT-FB-T-82-126 ..... N83-14416 #
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BMO-TR-82-28 ..... N83-14436 #

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BNL-30033 ..... N83-14780 #
BNL-30057 ..... N83-14303 #
BNL-30081 ..... N83-15083 #
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